Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 11:03 AM
To: Fitzsimmons, Alexander
Subject: RE: Solar FOA Topic 1 Cancelation and Re-release

Okay thanks!

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 2:01 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA Topic 1 Cancelation and Re-release

No. It's an amendment to a previously approved FOA.

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Thursday, Aug 30, 2018, 1:50 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: Solar FOA Topic 1 Cancelation and Re-release

What are your thoughts on this?

From: Hamos, Ian
Sent: Thursday, August 30, 2018 1:23 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Subject: Solar FOA Topic 1 Cancelation and Re-release

Bindu,

As I'm sure you are aware, (b) (5)
(b) (5)

Thanks,

Ian Hamos
Chief of Staff
Office of the DAS for Renewable Power
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC, 20585

Rodriguez, Susan (CONTR)

From: Hamos, Ian
Sent: Thursday, August 30, 2018 11:21 AM
To: Jacob, Bindu
Cc: Unruh, Timothy;Gay, Charlie;Pezzullo, Leslie
Subject: RE: Solar FOA Topic 1 Cancelation and Re-release

Categories: No Action Required

Excellent, thanks!

Ian Hamos
Chief of Staff
Office of the DAS for Renewable Power
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC, 20585

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 2:03 PM
To: Hamos, Ian <Ian.Hamos@EE.doe.gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Subject: RE: Solar FOA Topic 1 Cancelation and Re-release

(b) (5)

From: Hamos, Ian
Sent: Thursday, August 30, 2018 1:23 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Subject: Solar FOA Topic 1 Cancelation and Re-release

Bindu,

As I'm sure you are aware, (b) (5)

Thanks,

Ian Hamos
Chief of Staff
Office of the DAS for Renewable Power
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC, 20585

Rodriguez, Susan (CONTR)

From:	Fitzsimmons, Alexander
Sent:	Thursday, August 30, 2018 3:49 PM
To:	Szymanski, Jessica;Brace, Conner
Cc:	Jacob, Bindu
Subject:	FW: Solar FOA
Attachments:	SETO FOA Topic Area 1 Notice with NOI 20180830 Final.docx; EERE 103 - Notice of Intent (NOI) DE-FOA-0001986 Final 20180830.docx

See below.

-----Original Message-----
From: Passarelli, Derek
Sent: Thursday, August 30, 2018 6:04 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: Solar FOA

Alex and Bindu,

Attached are the final versions of the Notice to the current Solar FOA Topic 1 applicants (with the NOI provided below the Notice) and the NOI. Subject to any final changes and approval from you and Cathy, Golden will issue the Notice and NOI concurrently at 1 pm MDT (3 PM EDT) tomorrow.

Let me know if you have any concerns, questions, or further instructions.

Derek G. Passarelli
Director
Golden Field Office
Office of Energy Efficiency and Renewable Energy
United States Department of Energy
240.562.1742

SETO FOA TOPIC AREA 1 NOTICE

On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting an application in response to the Solar Energy Technology Office (SETO) FY18 Funding Opportunity Announcement (FOA) DE-FOA-0001840. We are writing to inform you of a change to Topic Area 1 of the FOA, Advanced Solar Systems Integration Technologies.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

In order to better align the FOA objectives to the mission objectives of DOE, EERE plans to revise Topic Area 1 and issue a new FOA. **Because a new FOA is planned, if you would like to apply to the revised Area Topic 1, an application must be submitted under the new FOA in EERE Exchange by the deadline**. Please carefully review the revised emphasis and program objectives when the new FOA is issued, and revise your application accordingly.

On behalf of EERE, I would like to express our sincere appreciation for the significant time and effort you and your team invested in preparing this application, and for your interest and participation in the EERE Solar Energy Technologies Office activities. We hope that you will continue to participate in future activities and programs with EERE.

The Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001987 is provided below for your reference.

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration

This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load)

This is a Notice of Intent (NOI) only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different than the FOA described herein, or EERE may not issue a FOA at all.

available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or

more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about September 15, 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

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In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration
This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER

options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

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- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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Rodriguez, Susan (CONTR)

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 3:49 PM
To: Passarelli, Derek;Jacob, Bindu
Subject: RE: Solar FOA

Approved.

-----Original Message-----
From: Passarelli, Derek
Sent: Thursday, August 30, 2018 6:04 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: Solar FOA

Alex and Bindu,

Attached are the final versions of the Notice to the current Solar FOA Topic 1 applicants (with the NOI provided below the Notice) and the NOI. Subject to any final changes and approval from you and Cathy, Golden will issue the Notice and NOI concurrently at 1 pm MDT (3 PM EDT) tomorrow.

Let me know if you have any concerns, questions, or further instructions.

Derek G. Passarelli
Director
Golden Field Office
Office of Energy Efficiency and Renewable Energy
United States Department of Energy
240.562.1742

Rodriguez, Susan (CONTR)

From:	Fitzsimmons, Alexander
Sent:	Thursday, August 30, 2018 4:55 PM
To:	Jacob, Bindu;Forcier, Bridget;Renfro, Mindy
Cc:	Brace, Conner;Oliver, Martha;Mills, Allison;DeCesaro, Jennifer;Szymanski, Jessica
Subject:	RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent
Attachments:	EERE 103 - Notice of Intent (NOI) DE-FOA-0001986 Final 20180830.docx; SETO FOA Topic Area 1 Notice with NOI 20180830 Final.docx

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget --As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EEREL egAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie

<Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

Solar Situational Awareness and Analysis – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing.

Solar Technology Transfer – This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration
This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER

options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

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Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

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- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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SETO FOA TOPIC AREA 1 NOTICE

On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting an application in response to the Solar Energy Technology Office (SETO) FY18 Funding Opportunity Announcement (FOA) DE-FOA-0001840. We are writing to inform you of a change to Topic Area 1 of the FOA, Advanced Solar Systems Integration Technologies.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

In order to better align the FOA objectives to the mission objectives of DOE, EERE plans to revise Topic Area 1 and issue a new FOA. **Because a new FOA is planned, if you would like to apply to the revised Area Topic 1, an application must be submitted under the new FOA in EERE Exchange by the deadline**. Please carefully review the revised emphasis and program objectives when the new FOA is issued, and revise your application accordingly.

On behalf of EERE, I would like to express our sincere appreciation for the significant time and effort you and your team invested in preparing this application, and for your interest and participation in the EERE Solar Energy Technologies Office activities. We hope that you will continue to participate in future activities and programs with EERE.

The Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001987 is provided below for your reference.

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

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- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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Rodriguez, Susan (CONTR)

From:	Jacob, Bindu
Sent:	Thursday, August 30, 2018 4:59 PM
To:	Passarelli, Derek
Subject:	FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent
Attachments:	EERE 103 - Notice of Intent (NOI) DE-FOA-0001986 Final 20180830.docx; SETO FOA Topic Area 1 Notice with NOI 20180830 Final.docx

FYI – looks like we don't actually require concurrence on an NOI. We have provided it to CI, CF and PA just in case. I'll let you know if there is any reason why it can't go out at 3 PM EST. Looks like lots of folks in SETO received the NOI, but they do not have the revision notice (unless received from Charlie).

Thanks!

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations

Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

Solar Situational Awareness and Analysis – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing.

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EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)
(b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Notice of Intent No. DE-FOA-0001986

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SETO FOA TOPIC AREA 1 NOTICE

On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting an application in response to the Solar Energy Technology Office (SETO) FY18 Funding Opportunity Announcement (FOA) DE-FOA-0001840. We are writing to inform you of a change to Topic Area 1 of the FOA, Advanced Solar Systems Integration Technologies.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

In order to better align the FOA objectives to the mission objectives of DOE, EERE plans to revise Topic Area 1 and issue a new FOA. **Because a new FOA is planned, if you would like to apply to the revised Area Topic 1, an application must be submitted under the new FOA in EERE Exchange by the deadline**. Please carefully review the revised emphasis and program objectives when the new FOA is issued, and revise your application accordingly.

On behalf of EERE, I would like to express our sincere appreciation for the significant time and effort you and your team invested in preparing this application, and for your interest and participation in the EERE Solar Energy Technologies Office activities. We hope that you will continue to participate in future activities and programs with EERE.

The Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001987 is provided below for your reference.

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration

This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load)

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available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or

more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about September 15, 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

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In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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Document 7

Rodriguez, Susan (CONTR)

From: Passarelli, Derek
Sent: Thursday, August 30, 2018 5:18 PM
To: Jacob, Bindu
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

I just finished a long call with Charlie. (b) (5) he understands the course of action and that we will be releasing the Notice and NOI tomorrow afternoon.

We only worked the NOI through staff. The revision notice was worked with Charlie. I deferred to him if he wanted to work with any of his staff on it.

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Thursday, Aug 30, 2018, 5:59 PM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

FYI – looks like we don't actually require concurrence on an NOI. We have provided it to CI, CF and PA just in case. I'll let you know if there is any reason why it can't go out at 3 PM EST. Looks like lots of folks in SETO received the NOI, but they do not have the revision notice (unless received from Charlie).

Thanks!

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
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Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

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Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

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EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)
(b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 5:58 PM
To: Fitzsimmons, Alexander
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

(b) (5)

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
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Thanks Bindu. Adding Jess.

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Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

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Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

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Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

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Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From: Passarelli, Derek
Sent: Friday, August 31, 2018 7:16 AM
To: Jacob, Bindu
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent
Attachments: SETO FOA Topic Area 1 Notice with NOI 20180831 Final.docx

Here is the revised version with the two corrections.

From: Passarelli, Derek
Sent: Friday, August 31, 2018 8:14 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

It is a mistake. It will be corrected. Also, I believe the second to last paragraph of the Notice to the Topic Area Applicants should read: (b) (5)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 8:05 AM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

See below - is that a mistake?

From: Renfro, Mindy L <renfroml@id.doe.gov>
Date: Friday, Aug 31, 2018, 10:02 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

One more question – (b) (5) (b) (5) Is that correct or a mistake. I can't tell.

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy L <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
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Solar Technology Transfer – This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

SETO FOA TOPIC AREA 1 NOTICE

On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting an application in response to the Solar Energy Technology Office (SETO) FY18 Funding Opportunity Announcement (FOA) DE-FOA-0001840. We are writing to inform you of a change to Topic Area 1 of the FOA, Advanced Solar Systems Integration Technologies.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

In order to better align the FOA objectives to the mission objectives of DOE, EERE plans to revise Topic Area 1 and issue a new FOA. **Because a new FOA is planned, if you would like to apply to the revised Topic Area 1, an application must be submitted under the new FOA in EERE Exchange by the deadline**. Please carefully review the revised emphasis and program objectives when the new FOA is issued, and revise your application accordingly.

On behalf of EERE, we would like to express our sincere appreciation for the significant time and effort you and your team invested in preparing this application, and for your interest and participation in the EERE Solar Energy Technologies Office activities. We hope that you will continue to participate in future activities and programs with EERE.

The Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001987 is provided below for your reference.

Rodriguez, Susan (CONTR)

From:	Jacob, Bindu
Sent:	Friday, August 31, 2018 7:27 AM
To:	Fitzsimmons, Alexander;Forcier, Bridget;Renfro, Mindy
Cc:	Brace, Conner;Oliver, Martha;Mills, Allison;DeCesaro, Jennifer;Szymanski, Jessica
Subject:	RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent
Attachments:	SETO FOA Topic Area 1 Notice with NOI 20180831 Final.docx

Here is a revised revision notice for topic area 1. We found 2 grammatical issues (thank you Mindy for finding one of them).

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

Solar Situational Awareness and Analysis – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing.

Solar Technology Transfer – This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure

solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)
(b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration

This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load)

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available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or

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more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about September 15, 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

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In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 7:27 AM
To: Passarelli, Derek
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks I sent this to CI/CF/PA.

From: Passarelli, Derek
Sent: Friday, August 31, 2018 10:16 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is the revised version with the two corrections.

From: Passarelli, Derek
Sent: Friday, August 31, 2018 8:14 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

It is a mistake. It will be corrected. Also, I believe the second to last paragraph of the Notice to the Topic Area Applicants should read: (b) (5)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 8:05 AM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

See below - is that a mistake?

From: Renfro, Mindy L <renfroml@id.doe.gov>
Date: Friday, Aug 31, 2018, 10:02 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

One more question – (b) (5) Is that correct or a mistake. I can't tell.

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy L <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

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Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

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Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EEREL egAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
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Thanks,
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John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

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1. (b) (5)
2.

3.

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Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

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EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From: Szymanski, Jessica
Sent: Friday, August 31, 2018 7:48 AM
To: Jacob, Bindu;Fitzsimmons, Alexander;Forcier, Bridget;Renfro, Mindy
Cc: Brace, Conner;Oliver, Martha;Mills, Allison;DeCesaro, Jennifer
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Good here thanks everyone!

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Friday, Aug 31, 2018, 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, Forcier, Bridget <Bridget.Forcier@hq.doe.gov>, Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>, Oliver, Martha <Martha.Oliver@hq.doe.gov>, Mills, Allison <Allison.Mills@hq.doe.gov>, DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>, Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is a revised revision notice for topic area 1. We found 2 grammatical issues (thank you Mindy for finding one of them).

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
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EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)
(b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From:	Brace, Conner
Sent:	Friday, August 31, 2018 7:57 AM
To:	Jacob, Bindu
Cc:	Fitzsimmons, Alexander;McCurdy, Jake;Oliver, Martha;Mills, Allison
Subject:	RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent
Attachments:	SETO FOA Topic Area 1 Notice with NOI 20180831 Final.docx; EERE 103 - Notice of Intent (NOI) DE-FOA-0001986 Final 20180830.docx

Thanks Bindu. Who exactly will I be sending these notifications to @3pm?

Conner W. Brace
Legislative Affairs Advisor
U.S. Department of Energy
(202)-287-5469 | Conner.Brace@hq.doe.gov

From: Jacob, Bindu
Sent: Friday, August 31, 2018 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
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EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI.(b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

SETO FOA TOPIC AREA 1 NOTICE

On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting an application in response to the Solar Energy Technology Office (SETO) FY18 Funding Opportunity Announcement (FOA) DE-FOA-0001840. We are writing to inform you of a change to Topic Area 1 of the FOA, Advanced Solar Systems Integration Technologies.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

In order to better align the FOA objectives to the mission objectives of DOE, EERE plans to revise Topic Area 1 and issue a new FOA. **Because a new FOA is planned, if you would like to apply to the revised Topic Area 1, an application must be submitted under the new FOA in EERE Exchange by the deadline**. Please carefully review the revised emphasis and program objectives when the new FOA is issued, and revise your application accordingly.

On behalf of EERE, we would like to express our sincere appreciation for the significant time and effort you and your team invested in preparing this application, and for your interest and participation in the EERE Solar Energy Technologies Office activities. We hope that you will continue to participate in future activities and programs with EERE.

The Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001987 is provided below for your reference.

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration

This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load)

This is a Notice of Intent (NOI) only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different than the FOA described herein, or EERE may not issue a FOA at all.

#2894.75

available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or

more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about September 15, 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

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In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration
This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER

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options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about September 15, 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

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Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 8:38 AM
To: Oliver, Martha
Cc: Brace, Conner
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

(b) (5)

From: Oliver, Martha
Sent: Friday, August 31, 2018 11:37 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

(b) (5)

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Friday, Aug 31, 2018, 11:32 AM
To: Oliver, Martha <Martha.Oliver@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

To give you some background, we are cancelling a topic in an existing FOA and the letter is going out to everyone who applied and letting them know we cancelled the topic but will be posting a new FOA soon that they can apply to. That is why we are sending them the NOI.

(b) (5)

From: Oliver, Martha
Sent: Friday, August 31, 2018 11:30 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>
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To: Brace, Conner <Conner.Brace@hq.doe.gov>

Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>, Oliver, Martha <Martha.Oliver@hq.doe.gov>, Mills, Allison <Allison.Mills@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

For CF – sending it to approps staff is important.

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Martha would know best on that.

We will be sending these out at 3 to everyone who submitted an application and at the same time, the NOI will be posted.

From: Brace, Conner
Sent: Friday, August 31, 2018 10:57 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Who exactly will I be sending these notifications to @3pm?

Conner W. Brace
Legislative Affairs Advisor
U.S. Department of Energy
(202)-287-5469 | Conner.Brace@hq.doe.gov

From: Jacob, Bindu
Sent: Friday, August 31, 2018 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is a revised revision notice for topic area 1. We found 2 grammatical issues (thank you Mindy for finding one of them).

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

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Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
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Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From: Fitzsimmons, Alexander
Sent: Friday, August 31, 2018 9:28 AM
To: Jacob, Bindu
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Sure we can. I'll loop in Jess

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Friday, Aug 31, 2018, 12:25 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Are we going to be able to get a progress alert drafted and cleared through PA by 3:00? I can get Jenn started on it but you know the approvals better than I do.

From: Fitzsimmons, Alexander
Sent: Friday, August 31, 2018 12:24 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

But we should publicize the NOI so people know how to apply

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
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(b) (5)

The notice is only going to the applicants.

From: Fitzsimmons, Alexander
Sent: Friday, August 31, 2018 11:36 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

We're doing a progress alert right?

From: Oliver, Martha <Martha.Oliver@hq.doe.gov>
Date: Friday, Aug 31, 2018, 11:30 AM

To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>, Brace, Conner <Conner.Brace@hq.doe.gov>
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Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer

<Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
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U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 9:28 AM
To: McCurdy, Jake;Brace, Conner
Cc: Fitzsimmons, Alexander;Oliver, Martha;Mills, Allison;Forcier, Bridget;DeCesaro, Jennifer
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

After more discussion, we are going to draft a progress alert about the new NOI. We are working on that ASAP and will share.

CI – (b) (5)

From: McCurdy, Jake
Sent: Friday, August 31, 2018 12:10 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+ Bridget

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Friday, Aug 31, 2018, 11:04 AM
To: Brace, Conner <Conner.Brace@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>, Oliver, Martha <Martha.Oliver@hq.doe.gov>, Mills, Allison <Allison.Mills@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

For CF – sending it to approps staff is important.

(b) (5)

Martha would know best on that.

We will be sending these out at 3 to everyone who submitted an application and at the same time, the NOI will be posted.

From: Brace, Conner
Sent: Friday, August 31, 2018 10:57 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Who exactly will I be sending these notifications to @3pm?

Conner W. Brace
Legislative Affairs Advisor
U.S. Department of Energy
(202)-287-5469 | Conner.Brace@hq.doe.gov

From: Jacob, Bindu
Sent: Friday, August 31, 2018 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is a revised revision notice for topic area 1. We found 2 grammatical issues (thank you Mindy for finding one of them).

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations

Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

Solar Situational Awareness and Analysis – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing.

Solar Technology Transfer – This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy

alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 9:29 AM
To: Passarelli, Derek
Subject: RE: Solar FOA

yes

From: Passarelli, Derek
Sent: Friday, August 31, 2018 12:29 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: FW: Solar FOA

Do you draft the Progress Alert? I am not familiar with that activity.

From: Fitzsimmons, Alexander
Sent: Friday, August 31, 2018 10:25 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: RE: Solar FOA

Agree Bindu.

Also, we should have a EERE progress alert go out today. We need to make people aware of the NOI.

Please draft it short and concise.

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Friday, Aug 31, 2018, 12:18 PM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>, Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: RE: Solar FOA

My two cents:

I think we should have notices go out to entities that submitted concept papers

I think that we can (b) (5)

-----Original Message-----
From: Passarelli, Derek
Sent: Friday, August 31, 2018 12:03 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA

Alex and Bindu,

A couple questions have arisen for which I seek your thoughts. Do we want to reach out to the entities that had submitted concept papers to the original FOA, but did not submit a full application? If so, would we send the Notice we sent to the applicants that includes the NOI? It may bring more applicants to the new FOA.

Second, (b) (5)

Thank you for your consideration.

Derek

-----Original Message-----
From: Passarelli, Derek
Sent: Thursday, August 30, 2018 4:04 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: Solar FOA

Alex and Bindu,

Attached are the final versions of the Notice to the current Solar FOA Topic 1 applicants (with the NOI provided below the Notice) and the NOI. Subject to any final changes and approval from you and Cathy, Golden will issue the Notice and NOI concurrently at 1 pm MDT (3 PM EDT) tomorrow.

Let me know if you have any concerns, questions, or further instructions.

Derek G. Passarelli
Director
Golden Field Office
Office of Energy Efficiency and Renewable Energy
United States Department of Energy
240.562.1742

Rodriguez, Susan (CONTR)

From: Forcier, Bridget
Sent: Friday, August 31, 2018 10:08 AM
To: McCurdy, Jake;Jacob, Bindu;Brace, Conner;Renfro, Mindy
Cc: Fitzsimmons, Alexander;Oliver, Martha;Mills, Allison
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+Mindy Renfro

From: McCurdy, Jake
Sent: Friday, August 31, 2018 12:10 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+ Bridget

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Friday, Aug 31, 2018, 11:04 AM
To: Brace, Conner <Conner.Brace@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>, Oliver, Martha <Martha.Oliver@hq.doe.gov>, Mills, Allison <Allison.Mills@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

For CF – sending it to approps staff is important.

(b) (5)

Martha would know best on that.

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Sent: Friday, August 31, 2018 10:57 AM
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Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Who exactly will I be sending these notifications to @3pm?

Conner W. Brace
Legislative Affairs Advisor

U.S. Department of Energy
(202)-287-5469 | Conner.Brace@hq.doe.gov

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To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is a revised revision notice for topic area 1. We found 2 grammatical issues (thank you Mindy for finding one of them).

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
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Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

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Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

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solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)
(b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From: Passarelli, Derek
Sent: Friday, August 31, 2018 11:42 AM
To: Jacob, Bindu
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here you go:

1. (b) (5)

2. (b) (5)

3. (b) (5)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 9:05 AM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

(b) (5)

1. (b) (5)
2.

3.

From: Passarelli, Derek
Sent: Friday, August 31, 2018 10:16 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is the revised version with the two corrections.

From: Passarelli, Derek
Sent: Friday, August 31, 2018 8:14 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

It is a mistake. It will be corrected. Also, I believe the second to last paragraph of the Notice to the Topic Area Applicants should read: (b) (5)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 8:05 AM

To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

See below - is that a mistake?

From: Renfro, Mindy L <renfroml@id.doe.gov>
Date: Friday, Aug 31, 2018, 10:02 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

One more question – (b) (5) Is that correct or a mistake. I can't tell.

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy L <renfroml@id.doe.gov>
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Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie

<Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
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Solar Situational Awareness and Analysis – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing.

Solar Technology Transfer – This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Friday, August 31, 2018 1:31 PM
To: Oliver, Martha;McCurdy, Jake;Brace, Conner
Cc: Fitzsimmons, Alexander;Mills, Allison;Forcier, Bridget
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

After more discussion, we did not send a progress alert. The NOI was posted and notifications went to all applicants about Topic 1 on the existing FOA. We are working on a stakeholder email to highlight the NOI next week.

From: Oliver, Martha
Sent: Friday, August 31, 2018 4:29 PM
To: McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Not sure if anyone there was able to address this — (b) (5)

I think it could also be sent next week as an FYI, even if after the fact.

From: McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>
Date: Friday, Aug 31, 2018, 12:10 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>, Brace, Conner <Conner.Brace@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, Oliver, Martha <Martha.Oliver@hq.doe.gov>, Mills, Allison <Allison.Mills@hq.doe.gov>, Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+ Bridget

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Friday, Aug 31, 2018, 11:04 AM
To: Brace, Conner <Conner.Brace@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>, Oliver, Martha <Martha.Oliver@hq.doe.gov>, Mills, Allison <Allison.Mills@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

For CF – sending it to approps staff is important.

(b) (5)

Martha would know best on that.

We will be sending these out at 3 to everyone who submitted an application and at the same time, the NOI will be posted.

From: Brace, Conner
Sent: Friday, August 31, 2018 10:57 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Who exactly will I be sending these notifications to @3pm?

Conner W. Brace
Legislative Affairs Advisor
U.S. Department of Energy
(202)-287-5469 | Conner.Brace@hq.doe.gov

From: Jacob, Bindu
Sent: Friday, August 31, 2018 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is a revised revision notice for topic area 1. We found 2 grammatical issues (thank you Mindy for finding one of them).

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

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Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From:	Renfro, Mindy L <renfroml@id.doe.gov>
Sent:	Friday, August 31, 2018 1:52 PM
To:	Jacob, Bindu;Jones, Dylan;Wahlert, Kayt;Gruse, Jessica (CONTR);Barth, John;EERE Legislative Affairs;DeCesaro, Jennifer
Cc:	Forcier, Bridget
Subject:	FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent
Attachments:	SETO FOA Topic Area 1 Notice with NOI 20180831 Final.docx

Jaime Shimek, HEWD Minority Clerk, has requested answers on this FOA. She asked that we not do anything publicly or formally as far as notifications go until the appropriators understand what is happening with this.

- How far along was the FOA process? Had applicants been selected and notified?

Let me know if you have any questions. I'll forward your answers along as soon as you send them to me. Thanks!!

Mindy Renfro
External Coordination
CFO Office of Budget
US Department of Energy
202-586-3260

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Sent: Friday, August 31, 2018 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy L <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
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Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
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Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
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Conner – I defer to CI if anyone else requires advance notice.

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Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

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EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

SETO FOA TOPIC AREA 1 NOTICE

On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting an application in response to the Solar Energy Technology Office (SETO) FY18 Funding Opportunity Announcement (FOA) DE-FOA-0001840. We are writing to inform you of a change to Topic Area 1 of the FOA, Advanced Solar Systems Integration Technologies.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

In order to better align the FOA objectives to the mission objectives of DOE, EERE plans to revise Topic Area 1 and issue a new FOA. **Because a new FOA is planned, if you would like to apply to the revised Topic Area 1, an application must be submitted under the new FOA in EERE Exchange by the deadline**. Please carefully review the revised emphasis and program objectives when the new FOA is issued, and revise your application accordingly.

On behalf of EERE, we would like to express our sincere appreciation for the significant time and effort you and your team invested in preparing this application, and for your interest and participation in the EERE Solar Energy Technologies Office activities. We hope that you will continue to participate in future activities and programs with EERE.

The Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001987 is provided below for your reference.

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration

This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load)

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available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or

---

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more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about September 15, 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

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In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

This is a Notice of Intent (NOI) only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different than the FOA described herein, or EERE may not issue a FOA at all.

Rodriguez, Susan (CONTR)

From: Gruse, Jessica (CONTR)
Sent: Friday, August 31, 2018 1:55 PM
To: Jacob, Bindu
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Okay, thanks! I was just going to ask who should run this.

From: Jacob, Bindu
Sent: Friday, August 31, 2018 4:54 PM
To: Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Barth, John <John.Barth@ee.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Team – I will handle questions on this FOA

From: Renfro, Mindy L [mailto:renfroml@id.doe.gov]
Sent: Friday, August 31, 2018 4:52 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Barth, John <John.Barth@ee.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Jaime Shimek, HEWD Minority Clerk, has requested answers on this FOA. She asked that we not do anything publicly or formally as far as notifications go until the appropriators understand what is happening with this.

- How far along was the FOA process? Had applicants been selected and notified?

Let me know if you have any questions. I'll forward your answers along as soon as you send them to me. Thanks!!

Mindy Renfro
External Coordination
CFO Office of Budget
US Department of Energy
202-586-3260

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Sent: Friday, August 31, 2018 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy L <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is a revised revision notice for topic area 1. We found 2 grammatical issues (thank you Mindy for finding one of them).

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget –As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>

Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

Solar Situational Awareness and Analysis – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing.

Solar Technology Transfer – This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b)(5)

Thanks,

John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From:	Jacob, Bindu
Sent:	Friday, August 31, 2018 2:00 PM
To:	Fitzsimmons, Alexander;Passarelli, Derek
Subject:	FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent
Attachments:	SETO FOA Topic Area 1 Notice with NOI 20180831 Final.docx

Alex/Derek,

See question from CFO from HEWD Minority – proposed responses in red.

My proposed response:

- How far along was the FOA process? EERE continues to evaluate the other Topic Areas to make award determinations.
- Had applicants been selected and notified? No selection notifications have gone out on this topic or any of the other topics in the FOA.

She asked that we not do anything publicly or formally as far as notifications go until the appropriators understand what is happening with this. The notifications has already gone out to all entities that provided concept papers and full applications. The NOI for the new FOA was also released.

From: Renfro, Mindy L [mailto:renfroml@id.doe.gov]
Sent: Friday, August 31, 2018 4:52 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Barth, John <John.Barth@ee.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Jaime Shimek, HEWD Minority Clerk, has requested answers on this FOA. She asked that we not do anything publicly or formally as far as notifications go until the appropriators understand what is happening with this.

- How far along was the FOA process? Had applicants been selected and notified?

Let me know if you have any questions. I'll forward your answers along as soon as you send them to me. Thanks!!

Mindy Renfro
External Coordination
CFO Office of Budget
US Department of Energy
202-586-3260

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Sent: Friday, August 31, 2018 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>;

Renfro, Mindy L <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
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Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
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Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
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Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM

To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

Solar Situational Awareness and Analysis – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing.

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EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)

(b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

SETO FOA TOPIC AREA 1 NOTICE

On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting an application in response to the Solar Energy Technology Office (SETO) FY18 Funding Opportunity Announcement (FOA) DE-FOA-0001840. We are writing to inform you of a change to Topic Area 1 of the FOA, Advanced Solar Systems Integration Technologies.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

In order to better align the FOA objectives to the mission objectives of DOE, EERE plans to revise Topic Area 1 and issue a new FOA. **Because a new FOA is planned, if you would like to apply to the revised Topic Area 1, an application must be submitted under the new FOA in EERE Exchange by the deadline**. Please carefully review the revised emphasis and program objectives when the new FOA is issued, and revise your application accordingly.

On behalf of EERE, we would like to express our sincere appreciation for the significant time and effort you and your team invested in preparing this application, and for your interest and participation in the EERE Solar Energy Technologies Office activities. We hope that you will continue to participate in future activities and programs with EERE.

The Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001987 is provided below for your reference.

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration

This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load)

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available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or

more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about September 15, 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

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In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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Rodriguez, Susan (CONTR)

From:	Jacob, Bindu
Sent:	Saturday, September 01, 2018 11:24 PM
To:	Renfro, Mindy;Jones, Dylan;Wahlert, Kayt;Gruse, Jessica (CONTR);Barth, John;EERE Legislative Affairs;DeCesaro, Jennifer
Cc:	Forcier, Bridget
Subject:	RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

How about this for the first question.

The FOA (DE-FOA-0001850) was initially announced in April, 2018. It included 4 topics. The only topic that is being changed is Topic 1, Advanced Solar Systems Integration. The other 3 topics are still being evaluated for award determinations.

As stated in the revision notice, the topic area is being changed to better align the FOA to the mission objectives of DOE. The revised language for the topic will be announced as a new FOA in September. EERE continues to evaluate the other Topic Areas to make award determinations.

From: Renfro, Mindy L <renfroml@id.doe.gov>
Date: Saturday, Sep 01, 2018, 9:23 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>, Jones, Dylan <Dylan.Jones@EE.Doe.Gov>, Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>, Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>, Barth, John <John.Barth@ee.doe.gov>, EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>, DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Bindu –

Can you give me some more information on the first question? How many Topic Areas were in the FOA? Topic Area 1 was changed . . . why? How long ago was the FOA announced? We want to give Jaime all the information we can so she doesn't keep coming back to us with more questions. Thanks!!

Mindy

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Sent: Saturday, September 1, 2018 1:05 PM
To: Renfro, Mindy L <renfroml@id.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Barth, John <John.Barth@ee.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>

Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Mindy,

As you know, the NOI was posted Friday at 3:00. The topic 1 notifications on the existing Solar FOA went out to all applicants who submitted concept papers and applications.

Answers to the questions:

> How far along was the FOA process? EERE continues to evaluate the other Topic Areas to make award determinations.
>
> Had applicants been selected and notified? No selection notifications have gone out on this topic or any of the other topics in the FOA.

From: Renfro, Mindy L <renfroml@id.doe.gov>
Date: Friday, Aug 31, 2018, 4:51 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>, Jones, Dylan <Dylan.Jones@EE.Doe.Gov>, Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>, Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>, Barth, John <John.Barth@ee.doe.gov>, EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>, DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Jaime Shimek, HEWD Minority Clerk, has requested answers on this FOA. She asked that we not do anything publicly or formally as far as notifications go until the appropriators understand what is happening with this.

- How far along was the FOA process? Had applicants been selected and notified?

Let me know if you have any questions. I'll forward your answers along as soon as you send them to me. Thanks!!

Mindy Renfro
External Coordination
CFO Office of Budget
US Department of Energy
202-586-3260

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Sent: Friday, August 31, 2018 10:27 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy L <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Here is a revised revision notice for topic area 1. We found 2 grammatical issues (thank you Mindy for finding one of them).

From: Fitzsimmons, Alexander
Sent: Thursday, August 30, 2018 7:55 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Szymanski, Jessica <Jessica.Szymanski@hq.doe.gov>
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Thanks Bindu. Adding Jess.

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 7:46 PM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>; Renfro, Mindy <renfroml@id.doe.gov>
Cc: Brace, Conner <Conner.Brace@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

+CF / revised distribution to a smaller group

Also attached is the revision notice (SETO FOA Topic Area 1 Notice with NOI document) that will go out to all applicants who submitted applications to the existing Solar FOA, topic 1. These notices will go out at 3:00 PM EST at the same time that the NOI is posted. The revision notice also includes a copy of the NOI.

Bridget --As discussed, can you send an advance notice to approps staff at 2:00 PM EST.

Conner – I defer to CI if anyone else requires advance notice.

Please reach out with any concerns.

Thank you,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Horst, John
Sent: Thursday, August 30, 2018 7:14 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Jones, Dylan <Dylan.Jones@EE.Doe.Gov>; Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Mills, Allison <Allison.Mills@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>; Brace, Conner <Conner.Brace@hq.doe.gov>; EERE Legislative Affairs <EERELegAffairs@EE.Doe.Gov>; Rivers, Jennifer <Jennifer.Rivers@ee.doe.gov>; EEREStakeholderEngagement <EEREStakeholderEngagement@EE.Doe.Gov>
Cc: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Brodie, Pamela <Pamela.Brodie@ee.Doe.Gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer

<Jennifer.Decesaro@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Sher, Jono <jono.sher@ee.doe.gov>; Stowers, Christina (CONTR) <Christina.Stowers@EE.Doe.Gov>; Cone, Kristin (CONTR) <Kristin.Cone@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hello,

EERE's Solar Energy Technologies Office (SETO) would like to issue a Notice of Intent (NOI) for its "Advanced Solar Systems Integration Technologies." The focus supports early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. SETO invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

Areas of Interest:

Solar Grid Integration – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats.

Solar Situational Awareness and Analysis – This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing.

Solar Technology Transfer – This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years. For more, see the attached NOI. (b) (5)
(b) (5)

Thanks,
John

John Horst, APR
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Communications | Media Relations
Office: 720-356-1580
Mobile: (b) (6)

Rodriguez, Susan (CONTR)

From:	Jacob, Bindu
Sent:	Tuesday, September 04, 2018 7:43 AM
To:	Kolb, Ingrid
Cc:	Fitzsimmons, Alexander;Tirado, Christopher
Subject:	Inquiry on Solar FOA
Attachments:	SETO FOA Topic Area 1 Notice with NOI 20180831 Final.docx

Ingrid,

I was told that a question came up about a Solar FOA in the DOE senior leadership meeting from CFO. To give you a quick recap – we revised the text of topic 1 from (DE-FOA-0001850). The revisions to the topic required us to reopen the topic for applications. We decided that the best path forward was to issue a new FOA for the revised topic and move forward with the selection process on the remaining topics in the original FOA. On Friday, we issued an NOI (FOA-0001840) about the new FOA. We also sent letters to all applicants letting them know that Topic 1 was revised and that a new FOA was forthcoming. The notice to applicants also included the text of the NOI (see attached).

(b) (5)

CFO also provided a copy of the attached to the appropriations staff on Friday.

Please feel free to reach out to me or Alex with any additional questions.

Thanks,
Bindu

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

SETO FOA TOPIC AREA 1 NOTICE

On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting an application in response to the Solar Energy Technology Office (SETO) FY18 Funding Opportunity Announcement (FOA) DE-FOA-0001840. We are writing to inform you of a change to Topic Area 1 of the FOA, Advanced Solar Systems Integration Technologies.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

In order to better align the FOA objectives to the mission objectives of DOE, EERE plans to revise Topic Area 1 and issue a new FOA. **Because a new FOA is planned, if you would like to apply to the revised Topic Area 1, an application must be submitted under the new FOA in EERE Exchange by the deadline**. Please carefully review the revised emphasis and program objectives when the new FOA is issued, and revise your application accordingly.

On behalf of EERE, we would like to express our sincere appreciation for the significant time and effort you and your team invested in preparing this application, and for your interest and participation in the EERE Solar Energy Technologies Office activities. We hope that you will continue to participate in future activities and programs with EERE.

The Notice of Intent to Issue Funding Opportunity Announcement No. DE-FOA-0001987 is provided below for your reference.

Notice of Intent No. DE-FOA-0001986

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001987

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Solar Energy Technology Office, a Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies".

This FOA supports the mission of the Solar Energy Technologies Office (SETO) which is to support early-stage research and development to improve the performance and flexibility of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use, storage and dispatch of solar energy, and lower solar electricity costs.

DOE is committed to improving the affordability of energy technologies and strengthening the Energy Sector's capability to withstand cyber and physical threats, including natural disasters. Improving the strategic location and situational awareness of solar systems can help ensure continuity of service in the face of widespread and coordinated threats. Developing innovative approaches to accelerate the transfer of solar system solutions that will improve Energy Sector resilience is also a priority.

It is anticipated that the FOA may include the following Areas of Interest:

Topic 1.1 Solar Grid Integration

This topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should identify the strategic location of solar photovoltaic (PV) systems that will ensure the Energy Sector provides continuity of service in the face of wide spread and coordinated threats. These solutions can be deployed throughout the bulk power systems or associated transmission to distribution substations. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). The approaches will test the systems' ability to operate and adapt at both steady and degraded states. Applications must consider diverse DER options (e.g. photovoltaics, energy storage, and flexible load)

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available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed solutions. It should also be shown in these solutions how a fleet of multiple photovoltaics systems from multiple locations will be able to respond to fast changing conditions under normal operations and provide power to critical loads during grid outages – with consideration of other DER options and distribution system constraints. Example projects may include, but are not limited to, new design and use-case concepts, essential reliability services, adaptive capabilities, voltage support, previously uncontemplated and unique capabilities and control hardware and software innovations for smart PV inverters and DER management systems. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar photovoltaic projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These solar photovoltaic projects shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.2 Solar Situational Awareness and Analysis

This Topic will support applications to research and field validate unique and innovative solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Specifically, the solutions should enhance operator capability to observe solar systems deployed throughout the bulk power systems or associated transmission to distribution substations or Behind-the-Meter (BTM) solar including but not limited to battery storage, systems controls, and demand response. Primary focus areas include solar photovoltaic integrated sensor technologies, secure and robust electricity supply delivery and communication tools, advanced data analytics including Artificial Intelligence and Machine to Machine capabilities, and voltage testing. Projects with secondary focus areas may also be considered which include the integration of observed data into planning, operations and business unit systems that would operate at both steady and degraded states. Applications must have an assessment of economic viability of the proposed system, activity or component in the respective part of the project.

Applicant's solar situational awareness and analysis projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or

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more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

Topic 1.3 Solar Technology Transfer

This topic will explore unique and innovative approaches to accelerate the transfer of solar system solutions that will improve the resiliency of the Energy Sector's capability to withstand all hazards; focusing on cyber and physical vectors. Potential areas of interest include, but are not limited to, projects or models that deploy alternative capital, for technology R&D transfer, incentivize industry-researcher collaboration, leverage existing facilities or capabilities, data and build approaches and methods that serve to drive down the hardware cost and ensure solutions, validation, certifications, resilience and electricity supply to withstand wide spread and coordinated threats compatible with Topic 1.1 and Topic 1.2

Applicant's solar technology transfer projects may require working with critical infrastructure owners and operators and state, local, tribal and territories entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof. These projects shall seek to contribute to one or more risk components: reduce vulnerabilities, minimize consequences, identify and disrupt threats, and/or hasten response and recovery efforts related to critical infrastructure to ensure public health and safety while improving national security and economic security.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 3 years.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about September 15, 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

This is a Notice of Intent (NOI) only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different than the FOA described herein, or EERE may not issue a FOA at all.

In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov

- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

This is a Notice of Intent (NOI) only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different than the FOA described herein, or EERE may not issue a FOA at all.

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Tuesday, September 04, 2018 11:58 AM
To: Passarelli, Derek
Subject: FOA changes

(b) (5)

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Wednesday, September 05, 2018 10:54 AM
To: Gruse, Jessica (CONTR);DeCesaro, Jennifer
Subject: RE: Solar FOAs

Sorry slight revision

In order to better align the FOA objectives to the mission objectives of DOE, EERE is revising Topic Area 1, Advanced Solar Systems Integration Technologies, within the existing FOA (FOA-0001840). The NOI is announcing the intent to release the new FOA. A notification was sent to all entities who submitted a concept paper to Topic 1 letting them know about the revision and directing them to the NOI. The new FOA is expected to be released in mid-September.

The other three topics from the existing FY 2018 FOA are still being evaluated for award determinations. EERE anticipates that selections will be made later in September on those topics.

From: Jacob, Bindu
Sent: Wednesday, September 05, 2018 1:49 PM
To: Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>
Subject: RE: Solar FOAs

Response already cleared by Alex:

In order to better align the FOA objectives to the mission objectives of DOE, EERE is revising Topic Area 1, Advanced Solar Systems Integration Technologies, within the existing FOA (FOA-0001840). The NOI is announcing the intent to release the new FOA. A notification was sent to all applications who submitted a concept paper to Topic 1 letting them know about the revision and directing them to the NOI. The new FOA is expected to be released in mid-September.

The other three topics from the existing FY 2018 FOA are still being evaluated for award determinations. EERE anticipates that selections will be made later in September on those topics.

From: Gruse, Jessica (CONTR)
Sent: Tuesday, September 04, 2018 2:09 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; DeCesaro, Jennifer <Jennifer.Decesaro@ee.doe.gov>
Subject: FW: Solar FOAs

Hi Bindu, Jenn,

SENR minority is inquiring about the SETO NOI published on Friday. Please advise on path forward.

Thanks,
Jess

From: Oliver, Martha
Sent: Tuesday, September 04, 2018 1:52 PM

To: Gruse, Jessica (CONTR) <Jessica.Gruse@EE.DOE.Gov>
Subject: FW: Solar FOAs

From: McKee, Scott (Energy) [mailto:Scott_McKee@energy.senate.gov]
Sent: Tuesday, September 04, 2018 1:26 PM
To: McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>; Affolter, Shawn <Shawn.Affolter@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>
Subject: Solar FOAs

Jake, Shawn, and Martha,

Hope you had a great long weekend!

I saw the Notice of Intent for Advanced Solar Systems Integration Technologies from Friday, and I was wondering how/if it overlaps or is intended to be in addition to the previous SETO FOA FY 2018.

Also, do you know the timing on when the award selections will be announced from the SETO FOA FY 2018? It was estimated to be this month.

Thanks!

Scott McKee
Democratic Professional Staff Member
U.S. Senate Committee on Energy & Natural Resources
scott_mckee@energy.senate.gov
202-224-6836

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Thursday, September 06, 2018 4:25 AM
To: Fitzsimmons, Alexander
Cc: Passarelli, Derek
Subject: RE: CFO Follow Up on Solar

Thanks

From: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Date: Thursday, Sep 06, 2018, 7:17 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: RE: CFO Follow Up on Solar

Concur with edits.

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Wednesday, Sep 05, 2018, 8:42 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Cc: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: CFO Follow Up on Solar

Alex,

CFO asked for a high level summary of the changes made to topic 1. Please let me know if you concur with this response:

(b) (5)

Thanks,

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Friday, September 14, 2018 5:50 AM
To: DeCesaro, Jennifer
Subject: FW: Solar FOA

Alex wants a stakeholder blast for the FOA. (b) (5)
Can you work with Solar to have a stakeholder blast drafted. They(b) (5)

From: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Date: Thursday, Sep 13, 2018, 6:25 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>, Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: RE: Solar FOA

Where are we with this? I'd think a stakeholder blast.

From: Jacob, Bindu
Sent: Tuesday, September 11, 2018 3:52 PM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: RE: Solar FOA

Alex,
(b) (5)

From: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Date: Tuesday, Sep 11, 2018, 3:49 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA

Alex,

Golden financial assistance staff is working with SETO staff to prepare the FOA and FRD in parallel. Subject to reviews and the greenlight process, it is possible that the FOA will be ready to post by Friday September 14.

The new FOA and FRD should be ready for review tomorrow am. (b) (5)
the required review process includes the review of the Selection Official, General Counsel, IP Counsel, NEPA Compliance Officer, Division Director, Financial Assistance Policy, Financial Assistance Director, and Head of Contracting Activity. Given that there are not significant changes in the proposed FOA from the original FOA, reviews can be expedited.

Once all of the reviews are complete, the FRD and FOA will have to be sent to EE-1 for review and approval. Once approved by EE-1, we can request a green light from Public Affairs to post the FOA. Once we receive the green light from Public Affairs, we can post the FOA.

Any delays in the reviews or greenlight process may push the FOA posting back to next week, but we are pushing on all reviewers to prioritize their reviews.

Let me know if you have any additional questions.

Derek

From: Fitzsimmons, Alexander
Sent: Tuesday, September 11, 2018 9:00 AM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA

What is the timeline for issuing the revised Topic 1 FOA?

From: Passarelli, Derek
Sent: Wednesday, September 05, 2018 1:53 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA

I concur one minor proposed edit below:

In order to better align the FOA objectives to the mission objectives of DOE, EERE is revising Topic Area 1, Advanced Solar Systems Integration Technologies, within the existing FOA (FOA-0001840). The NOI is announcing the intent to release the new FOA. A notification was sent to all [redacted] entities who submitted a concept paper to Topic 1 letting them know about the revision and directing them to the NOI. The new FOA is expected to be released in mid-September.

The other three topics from the existing FY 2018 FOA are still being evaluated for award determinations. EERE anticipates that selections will be made later in September on those topics.

From: Fitzsimmons, Alexander
Sent: Wednesday, September 05, 2018 11:48 AM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: RE: Solar FOA

Concur

From: Jacob, Bindu
Sent: Wednesday, September 05, 2018 1:47 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: Solar FOA

As discussed, we received a request through CI from SENR (see below) asking about the Solar FOA.

My response – please concur

(b) (5)

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: McKee, Scott (Energy) [mailto:Scott_McKee@energy.senate.gov]
Sent: Tuesday, September 04, 2018 1:26 PM
To: McCurdy, Jake <Jake.Mccurdy@hq.doe.gov>; Affolter, Shawn <Shawn.Affolter@hq.doe.gov>; Oliver, Martha <Martha.Oliver@hq.doe.gov>
Subject: Solar FOAs

Jake, Shawn, and Martha,

Hope you had a great long weekend!

I saw the Notice of Intent for Advanced Solar Systems Integration Technologies from Friday, and I was wondering how/if it overlaps or is intended to be in addition to the previous SETO FOA FY 2018.

Also, do you know the timing on when the award selections will be announced from the SETO FOA FY 2018? It was estimated to be this month.

Thanks!

Scott McKee
Democratic Professional Staff Member
U.S. Senate Committee on Energy & Natural Resources
scott_mckee@energy.senate.gov
202-224-6836

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Monday, September 17, 2018 6:12 AM
To: Forcier, Bridget
Subject: RE: Solar FOA

FYI - (b) (5)

I know that there was a pending request for a meeting, but we were told that would not be happening.

From: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Date: Thursday, Sep 06, 2018, 2:34 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA

Thanks Bindu.

Bridget Forcier
External Coordination
The Office of Budget
Chief Financial Officer
U.S. Department of Energy
(202) 586-0176

From: Jacob, Bindu
Sent: Thursday, September 06, 2018 7:25 AM
To: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: Solar FOA

Bridget,

Below is a high level summary of what changed in Topic 1. To see the actual language changes, you can compare the language in the FOA (SETO FOA FY 2018.)to the language in the NOI (Notice of Intent for Advanced Solar Systems Integration Technologies).

(b) (5)

(b) (5)

Rodriguez, Susan (CONTR)

From: Passarelli, Derek
Sent: Wednesday, September 19, 2018 12:28 PM
To: Jacob, Bindu
Subject: RE: Question on Business Clearance

Thank you! We are mobilizing on the FOA changes. I will get the draft to you as soon as we are done.

From: Jacob, Bindu
Sent: Wednesday, September 19, 2018 1:26 PM
To: Martin, Mimi <Mimi.Martin@hq.doe.gov>
Cc: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>; Carabajal, Stephanie <Stephanie.Carabajal@ee.Doe.Gov>
Subject: RE: Question on Business Clearance

Thank you very much. I greatly appreciate the quick response on this.

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Martin, Mimi
Sent: Wednesday, September 19, 2018 3:17 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>; Carabajal, Stephanie <Stephanie.Carabajal@ee.Doe.Gov>
Subject: RE: Question on Business Clearance

Good afternoon, Ms. Jacob. MA-621 waives review of the Office of Energy Efficiency and Renewable Energy (EERE) Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies" per your email request.

If you have questions or concerns, please contact me at (202) 287-1929.

Respectfully,

MiMi

MiMi D. Martin
Chief, Field Assistance and Oversight Division (MA-621)
Office of Contract Management
Office of Acquisition Management
U.S. Department of Energy
Office # 202-287-1929
Cell # (b) (6)
Find us on MAX.GOV @ https://community.max.gov/x/6IA2PQ

From: Jacob, Bindu
Sent: Wednesday, September 19, 2018 7:55 AM
To: Martin, Mimi <Mimi.Martin@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: Question on Business Clearance

Ms. Martin,

I was hoping you could help me with a question on the business clearance process. EERE released a $105M Solar FOA earlier in the year. (SETO FOA FY 2018.) The FOA was submitted for business clearance, but it was not selected for review by your office.

After the FOA had been posted and the application period closed, EERE's new leadership had conducted a review of the FOA internally. As part of that review, it was determined that Topic 1 within the FOA should be revised to better align the FOA to the mission objectives of DOE. (b) (5)

Since we were so far along in the selection process on the original FOA, it was decided that rather than do a FOA modification, we would instead cancel topic 1, proceed with selections on other topics and issue a new FOA for the revised topic 1. On August 31st, all entities that submitted an application or concept paper were informed that Topic 1 was cancelled and an NOI (Notice of Intent for Advanced Solar Systems Integration Technologies) was simultaneously posted indicating that the revised topic 1 would be posted in mid-September.

EERE leadership has been working on the revised FOA and would like to have it released expeditiously. The original topic 1 was $46M and we plan to release the new FOA at the same funding level. With cost share, this will exceed the $50M threshold for business clearance. Is there any way to waive the review (similar to the original FOA) and/or accelerate the review?

Please let me know. I'd be happy to discuss further or address any of your questions.

Thank you,

Bindu Jacob
Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
(202) 586-3821

Rodriguez, Susan (CONTR)

From: Passarelli, Derek
Sent: Wednesday, September 19, 2018 12:29 PM
To: Jacob, Bindu;Martin, Mimi
Cc: Carabajal, Stephanie
Subject: RE: Question on Business Clearance

Mimi,

I echo Bindu's sentiment. Thank you for your consideration and timely response.

Derek

From: Jacob, Bindu
Sent: Wednesday, September 19, 2018 1:26 PM
To: Martin, Mimi <Mimi.Martin@hq.doe.gov>
Cc: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>; Carabajal, Stephanie <Stephanie.Carabajal@ee.Doe.Gov>
Subject: RE: Question on Business Clearance

Thank you very much. I greatly appreciate the quick response on this.

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

From: Martin, Mimi
Sent: Wednesday, September 19, 2018 3:17 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>; Carabajal, Stephanie <Stephanie.Carabajal@ee.Doe.Gov>
Subject: RE: Question on Business Clearance

Good afternoon, Ms. Jacob. MA-621 waives review of the Office of Energy Efficiency and Renewable Energy (EERE) Funding Opportunity Announcement (FOA) entitled "Advanced Solar Systems Integration Technologies" per your email request.

If you have questions or concerns, please contact me at (202) 287-1929.

Respectfully,

MiMi

MiMi D. Martin
Chief, Field Assistance and Oversight Division (MA-621)
Office of Contract Management
Office of Acquisition Management

U.S. Department of Energy
Office # 202-287-1929
Cell # (b) (6)
Find us on MAX.GOV @ https://community.max.gov/x/6IA2PQ

From: Jacob, Bindu
Sent: Wednesday, September 19, 2018 7:55 AM
To: Martin, Mimi <Mimi.Martin@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: Question on Business Clearance

Ms. Martin,

I was hoping you could help me with a question on the business clearance process. EERE released a $105M Solar FOA earlier in the year. (SETO FOA FY 2018.) The FOA was submitted for business clearance, but it was not selected for review by your office.

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Since we were so far along in the selection process on the original FOA, it was decided that rather than do a FOA modification, we would instead cancel topic 1, proceed with selections on other topics and issue a new FOA for the revised topic 1. On August 31st, all entities that submitted an application or concept paper were informed that Topic 1 was cancelled and an NOI (Notice of Intent for Advanced Solar Systems Integration Technologies) was simultaneously posted indicating that the revised topic 1 would be posted in mid-September.

EERE leadership has been working on the revised FOA and would like to have it released expeditiously. The original topic 1 was $46M and we plan to release the new FOA at the same funding level. With cost share, this will exceed the $50M threshold for business clearance. Is there any way to waive the review (similar to the original FOA) and/or accelerate the review?

Please let me know. I'd be happy to discuss further or address any of your questions.

Thank you,

Bindu Jacob
Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
(202) 586-3821

Rodriguez, Susan (CONTR)

From: Fitzsimmons, Alexander
Sent: Tuesday, July 10, 2018 3:51 AM
To: Tripodi, Cathy
Subject: FW: FOAs
Attachments: FY18 FOAs (7-9-2018).xlsx; AMO- Desal NOI- 1949 (FOA-0001905).pdf; GTO - DRAFT - Machine Learning FOA (FOA 1956).docx; WETO - Advanced Wind R&D FOA (FOA 1924).docx; OWIP - FY17 SEP Comp MERIT REVIEW ADVISORY REPORT_7-6-18 _draft.docx

We should discuss

From: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Date: Monday, Jul 09, 2018, 9:06 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Cc: Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>, Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>
Subject: FOAs

Alex,

The full list of FOAs for FY18 is attached in the FY18 FOAs Excel file. We went through and color coded to make this as easy as possible.

Currently we only have six FOAs that have yet to be posted and 21 FOAs that have been posted. Of the 21 that have been posted, we've announced selections for six of them already.

The spreadsheet includes dates for the FOA Release (Column I) and the date of the public announcement (Column K).

Column I identifies the release date for the FOA.

- Green indicates a FOA that has already been released (21 FOAs)
- Orange indicates a FOA pending release within the next 30 days
  - 4 FOAs
    - GTO Machine Learning (7/19/2018) – DRAFT FOA Attached
    - WETO Advanced Wind R&D (7/10/2018) – DRAFT FOA Attached
    - AMO Energy-Water Desalination Hub (b) (5) – FOA Not ready, NOI Attached (NOI Release – xxx)
    - Water HydroNext (b) (5) – Will send DRAFT as soon as we receive it
- Gold indicates a FOA pending release in the next 31 – 90 days
  - 2 FOAs
    - (b) (5)
    -

For any FOA that has already been released (Green), the FOA# (column D) is hyperlinked to the actual FOA document.

Column K (b) (5)

- Green indicates the selections have already been announced
- (b) (5)
  - 1 FOA

        - SEP Competitive (7/13/2018) – Merit Review Advisory Report (MRAR) - FOA can be accessed through link in spreadsheet
- (b) (5)
    - 13 FOAs (b) (5)
- (b) (5)
    - 7 FOAs

Please keep in mind that the majority of the FOAs that have already been posted have also already closed and are in merit review. It is too late to change any of the criteria for any FOAs that have already closed. If we were to change the criteria for any that are still open, we'd need to publish a FOA amendment and extend the open timeframe for all applicants. We only have five that are still open and four of those close within the next 2 weeks, making it extremely difficult to make any changes at this point. The fifth is the BENEFIT FOA, but they collected concept papers with a deadline of 6/8, and restrict eligibility on full applications without a concept paper.(b) (5)

Let us know if there is anything else you need.

Bindu Jacob | Deputy Assistant Secretary for Operations
Energy Efficiency and Renewable Energy
O: (202) 586-3821

Work Plan / External Communications Tracker: FOA's Approved to Proceed (Pre-Award)
Program Office - EERE

Office	FOA #	FOA Name / Brief Description	$ Value (Estimated or Actual)	# Selections (Estimated or Actual)	Fiscal Year Funding	Date - FOA Release
AMO	DE-FOA-0001858	Flexible CHP Systems for Grid Support	$13,500,000	10	FY17	[redacted]

(b) (5)

BTO	DE-FOA-0001835	Building Energy Efficiency Stretchers & Innovation Technologies (BENEFIT) - 2018	$13,500,000	14 to 24	FY18	[redacted]
BTO	DE-FOA-0001873	Solid-State Lighting Advanced Technology R&D – 2018	$15,000,000	10 to 16	FY18	[redacted]
BTO	DE-FOA-0001874	Building America Industry Partnerships and Research Priorities for High Performance Housing Innovation - 2018	$11,500,000	10 to 30	FY18	[redacted]
DWIP	DE-FOA-0001644	State Energy Program - Competitive Awards	$5,000,000	30	FY17	[redacted]
DWIP	WAP-ALHD-2018	WAP Formula Awards	$247,500,000	56	FY18	[redacted]
DWIP	SEP-Base-2018	State Energy Program Formula Grants	$39,000,000	56	FY18	[redacted]
GTO	DE-FOA-0001860	Efficient Drilling for Geothermal Energy (EDGE)	$14,500,000	8 to 20	FY18	[redacted]
GTO	DE-FOA-0001862	Zonal Isolation Methodologies for Enhanced Geothermal Systems (EGS)	$4,450,000	4 to 10	FY18	[redacted]
GTO	TBD	Machine Learning for Geothermal Energy and the Geosciences	$2,625,000	4 to 8	FY18	(b) (5)
SETO	DE-FOA-0001830	Solar Energy Technologies Office FY18 Funding Opportunity Announcement	$105,500,000	20	FY18	[redacted]
WETO	DE-FOA-0001767	U.S. Offshore Wind Research and Development Consortium FOA	$20,000,000	1	FY18	[redacted]
WETO	DE-FOA-0001924	Advanced Wind R&D to Reduce Costs and Improve Environmental Performance	$6,000,000	6 to 8	FY18	(b) (5)
WETO	DE-FOA-0001923	Offshore Wind Resource Science	$8,000,000	1	FY18	(b) (5)
WPTO	DE-FOA-0001837	Marine and Hydrokinetic Technology Advancement and Data Dissemination	$25,500,000	Between 1 and 6	FY18	[redacted]
WPTO	DE-FOA-0001838	HydroNEXT: Standard Modular Hydropower & Pumped Storage Hydropower	$17,000,000	5 to 10	FY18	(b) (5)
BETO	DE-FOA-0001910	Process Development for Advanced Biofuels and Biopower	$30,000,000	5 to 11	FY18	[redacted]
BETO	DE-FOA-0001912	Affordable and Sustainable Energy Crops (ASEC)	$15,000,000	3 to 4	FY18	[redacted]
BETO	DE-FOA-0001908	Efficient Carbon Utilization in Algal Systems	$15,000,000	8 to 10	FY18	[redacted]
BETO	DE-FOA-0001916	BioEnergy Engineering for Products Synthesis (BEEPS)	$28,000,000	14 to 28	FY18	[redacted]
ACTO	DE-FOA-0001824	Fuel Cell Technologies Office Annual FOA	$39,000,000	28	FY18	[redacted]
VTO	DE-FOA-0001831	Medium/Heavy-Duty, On-Road Natural Gas Engine R&D	$4,000,000	3	FY17	[redacted]
VTO	DE-FOA-0001836	Energy Efficiency R&D for Plug-in Power Systems in Off-Road Vehicles	$4,500,000	3 to 4	FY17: $3M FY18: $1.5M	[redacted]
VTO	DE-FOA-0001905	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	$19,500,000	12	FY17: $15M FY18: $4.5M	[redacted]
VTO	DE-FOA-0001907	FY 18 Advanced Vehicle Technologies Research Funding Opportunity	$68,500,000	24 to 51	FY18	[redacted]

Key	
	Action Completed
	Action in Next 30 Days
	Action in Next 31-45 Days
	FY18 Awards

Notice of Intent No. DE-FOA-0001949

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0001905

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Advanced Manufacturing Office (AMO), a Funding Opportunity Announcement (FOA) entitled "Energy-Water Desalination Hub."

This FOA supports the establishment of an Energy Innovation Hub in the area of Energy-Water Desalination (referred to as the "Hub") to accelerate transformational advances in science and engineering focused on reducing the energy and cost requirements of desalination to provide clean and safe water[1]. The Hub will include highly collaborative research teams, spanning multiple scientific, engineering, and where appropriate, economic and public policy disciplines. By bringing together top talent from across the full spectrum of research and development (R&D) performers—including universities, private industry, non-profits, and National Laboratories—the Hub will serve as the world-leading R&D center in Energy-Water Desalination.

The Energy-Water Desalination Hub aligns with the Department of Energy (DOE) EERE/AMO strategic goals to: 1) improve the productivity and energy efficiency of U.S. manufacturing; 2) reduce lifecycle energy and resource impacts of manufactured goods; 3) leverage diverse domestic energy resources in U.S. manufacturing, while strengthening environmental stewardship; and 4) transition DOE supported innovative technologies and practices into U.S. manufacturing capabilities.

Successful Applicants will address key technical focus areas in Energy-Water Desalination and will operate as a coordinated R&D hub of experts across industry, university, and national laboratories, as well as other key stakeholders. The Hub will pursue a cohesive, strategic R&D investment portfolio with the highest impact for energy efficiency, water efficiency, and cost reductions to enable achievement of pipe parity of desalination from a range of water sources. Pipe parity will be defined using technical, cost, and environmental success metrics such as: energy intensity (energy/m3 water); levelized cost of water ($/m3 water) including assumptions about discount rate, plant life, etc.; life cycle energy; water intensity (m3/unit of end product); degree of utilization of unconventional water or energy sources, or exploiting synergies between energy systems; environmental considerations; and water system security and resiliency (e.g., risk of disruption, # of days of lost service).

[1] FY 2017 Congressional Budget Request for the Department of Energy's Advanced Manufacturing Office

This is a Notice of Intent (NOI) only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different than the FOA described herein, or EERE may not issue a FOA at all.

This model will strengthen cooperation in current and future energy-water nexus R&D activities within DOE (such as Fossil, EERE, and ARPA-E) and across multiple agencies (such as DOD, DOI, USDA, and EPA). The Hub is part of DOE's broader efforts to address issues at the energy-water nexus, which includes a developing initiative to use prizes and challenges to catalyze innovation in critical water issues.

It is anticipated that the FOA may include the following Technical Areas of Interest:

1. **Materials R&D**: Materials discovery has the potential to improve both materials in specific components and in water treatment systems for desalination and related water treatment technologies, including membranes, pipes, tanks and pumps that dramatically increase their performance, efficiency, longevity, etc.
2. **New Processes R&D:** Novel technology processes and system design concepts are needed to lower cost and energy for water treatment, including new technologies related to water pre-treatment systems (e.g. upstream from the desalination unit operation) and to address associated challenges such as water reuse, water efficiency, and high-value coproducts.
3. **Modeling & Simulation Tools:** Multi-scale models and simulation tools are needed to use and inform R&D to predict performance and optimize design and operation of new desalination technologies and related water-treatment systems.
4. **Integrated Data & Analysis:** In order to consistently define, track, and achieve pipe parity performance metrics in the highest impact areas, a central, strategic, non-biased, integrated analysis and metrics tracking team will be critical to the Hub's overall success.

As envisioned, the Hub will establish a central pillar in DOE and the nation's R&D efforts in this critically important and highly multi-disciplinary field, and will have a focus on low-energy and low-cost desalination system approaches. Enabling technologies and foundational science advances may also be applicable to production of municipal drinking water, production of agricultural water supplies, and treatment of nontraditional water sources, such as produced water from oil and gas extraction.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about July 2018 via the EERE Exchange website https://eere-exchange.energy.gov/. If Applicants wish to receive official notifications and information from

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This is a Notice of Intent (NOI) only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different than the FOA described herein, or EERE may not issue a FOA at all.

EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov
- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform
- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.
- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

This is a Notice of Intent (NOI) only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different than the FOA described herein, or EERE may not issue a FOA at all.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Department of Energy (DOE)
Office of Energy Efficiency and Renewable Energy (EERE)

Machine Learning for Geothermal Energy

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001956
FOA Type: Initial
CFDA Number: 81.087

FOA Issue Date:	7/19/2018
Informational Webinar:	(b) (5)
Submission Deadline for Concept Papers:	
Submission Deadline for Full Applications:	
Expected Submission Deadline for Replies to Reviewer Comments:	
Expected Date for EERE Selection Notifications:	January 2019
Expected Timeframe for Award Negotiations	March 2019

- Applicants must submit a Concept Paper by 5:00pm ET the due date listed above to be eligible to submit a Full Application.
- To apply to this FOA, applicants must register with and submit application materials through EERE Exchange at https://eere-Exchange.energy.gov, EERE's online application portal.
- Applicants must designate primary and backup points-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. If an application is selected for award negotiations, it is not a commitment to issue an award. It is imperative that the applicant/selectee be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancelation of further award negotiations and rescission of the Selection.

Commented [WG2]: (b) (5)

Table of Contents

Commented [TEM2]: When you are finished making changes to the FOA, make sure you update the Table of Contents. Right click anywhere on the table below and select "Update Field." When the box comes up, choose the "Update entire table" option to ensure that any sections you added/removed are reflected in the table. Please review the updated table of contents to ensure it does not contain erroneous information.

Questions about this FOA? Email machinelearningeo@ee.doe.gov
Problems with EERE Exchange? Email EERE- EERE-ExchangeSupport@hq.doe.gov Include FOA name and number in subject line.

#2894.162

#2894.163

I. Funding Opportunity Description

A. Description/Background

The rapidly advancing field of Machine Learning offers substantial opportunities for technology advancement and cost reduction throughout the geothermal project lifecycle, from resource exploration to power plant operations. The Geothermal Technologies Office published a Request for Information (RFI) in May 2018 to identify the most high-priority potential areas of research in this field. The majority of respondents to the RFI described opportunities that fall into two broad areas: 1) improved subsurface characterization, especially prior to drilling and 2) operational improvements for production of discovered resources. This funding opportunity seeks projects to investigate opportunities in each of these areas, which are described in more detail below.

Most of the identified applications of machine learning for subsurface characterization are attempts to solve one of four problem types: 1) regression, 2) classification, 3) clustering, and 4) dimensionality reduction. The first two are examples of supervised machine learning, and the latter are examples of unsupervised learning. Several RFI respondents described an idealized technology progression beginning with unsupervised methods (e.g. clustering) and a focus on knowledge discovery, and later moving to supervised methods (regression and classification) for the development of predictive tools and automation. Research utilizing both unsupervised and supervised methods has yielded insights that may be of use in exploration at multiple exploration scales. For example, examples exist in the literature[1] of using an unsupervised approach – self-organizing maps – to extract patterns from remote sensing data and develop large scale geologic maps. More recent work showed cluster analysis being used to detect previously unseen patterns in seismic data from an operating geothermal field[2]. The examples indicate that machine learning techniques offer one potential path to developing new capabilities in remotely characterizing the subsurface. Additional work is needed applying these tools toward problems in exploration, such as identifying and ranking of drilling targets.

Commented [WG4]: (b) (5)

Commented [WG5]: (b) (5)
(b) (5)

Supervised learning techniques, such as advanced regression utilizing neural networks, are currently used in oil and gas exploration. More recently, similar concepts have been used in geothermal assessments. The practice of Play Fairway analysis[3] is one example of this, however, extending the approach to include deep

[1] Reading and Cracknell SOMs
[2] Holtzman article from Science Advances
[3] Geothermal Play Fairway Analysis paper

learning methods could add new value to these applications. This depends on the availability of suitably large labeled datasets for geothermal environments. Where data does exist in sufficient volume, labels are often lacking. This could be remedied through some combination of organized expert labeling campaigns, use of synthetic training data, or confirmation drilling. The benefits would likely outweigh the costs, because application of deep learning techniques to large-scale, multi-physics datasets may lead to the discovery of new play types, or new signatures for the detection of hidden hydrothermal systems. These same regression techniques are also relevant in the later phases of exploration and production, as in estimating productivity based on high resolution imaging and/ or well logs. In addition, data science concepts can help guide the design of new data acquisition programs, by providing insight on the relative information value of various types of data. In this way, investments can be confined to the specific campaigns that are most likely to yield the information that is needed at each stage in an exploration program.

The second area of opportunities described by RFI respondents involves improving efficiencies in energy production through the analysis of operational power plant and reservoir data. Data sources could include downhole sensors, wellhead and other surface sensors, company databases, and power plant historians. Advanced analytics have been applied in fossil power generation as well as petroleum production for condition monitoring on critical equipment such as boilers, turbines, high-energy downhole pumps, and cooling/condensate systems. With the exception of the boiler, these systems are also present in geothermal plants and are therefore a potential target for predictive maintenance programs. The proliferation of low-cost, networked sensors has made some of these programs much more feasible. Potential benefits in this area could include improved capacity factor, reducing costly unplanned outages, and more sustainable reservoir management. All of these impact the levelized cost of electricity and competitiveness of geothermal energy.

Another theme that is relevant to both areas of interest above is the fact that valuable data is often highly unstructured, and is scattered across many organizations (or in many different silos at larger organizations). This is a significant barrier to implementing machine learning practices; technological solutions to this problem have been deployed by the petroleum industry in the form of knowledge graphs and data virtualization software platforms. These tools allow for multiple heterogenous data sources to be combined with domain expertise in ways that were previously impossible, leading to improved decision making. Enhancing dataset interoperability in this way is a significant challenge and an active area of research. Most of the identified work in this area has been

conducted on behalf of large private enterprises, based on concepts developed in the area of search engine technology. However, there may also be applications applying these tools to large public data repositories[4].

B. Topic Areas/Technical Areas of Interest

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Topic 1: Machine Learning for Geothermal Exploration

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GTO seeks projects that will advance geothermal exploration through the application of machine learning techniques to geological, geophysical, geochemical, borehole, and other relevant datasets. Of particular interest are projects that will identify drilling targets for future work. Awards will be limited to an initial 18-month period of performance and up to $500,000 federal funds. In the last six months of the period, projects will undergo a competitive Downselect process. Pending outcome of the Downselect process and availability of funds, a subset of awardees may be selected for continuation to a second project phase. The purpose of Phase 2 will be to to carry out technology validation. No new field data acquisition will be funded in Phase 1; applicants will be required to have access to existing datasets that are suitable for the proposed work. Field work including new data acquisition may be funded in Phase 2.

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Research objectives include the following:

- Developing open community datasets for future work in ML, especially labeled datasets
- Identifying drilling targets with high scientific value for future work
- Building multi-disciplinary teams including both geothermal and machine learning expertise
- Identifying new signatures for hidden geothermal systems
- Developing new capabilities for characterizing subsurface temperature, permeability, and stress state

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Topic 2: Advanced Analytics for Efficiency and Automation in Geothermal Operations

GTO seeks projects that would apply advanced analytics to power plant and other operator datasets, with the goal of improving operations and resource management. Awards will be for a 24-month period of performance, and maximum $700,000 DOE share. Project teams should include an industry partner,

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[4] Geothermal Data Repository, NETL EDX, PASCAL IRIS <-insert links

or otherwise negotiate access to relevant datasets prior to submitting a full application.

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Research objectives include the following:

- Optimizing power production through power plant/ reservoir monitoring and analytics
- Implementing predictive maintenance on critical pieces of equipment, both surface and downhole
- Improving detection of trouble events
- Establishing improved data analytical capabilities in geothermal operations

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All work under EERE funding agreements must be performed in the United States. See Section IV.J.3 and Appendix C.

C. Applications Specifically Not of Interest

The following types of applications will be deemed nonresponsive and will not be reviewed or considered (See Section III.D of the FOA):

- Applications that fall outside the technical parameters specified in Section I.B of the FOA
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).
- Applications that are not relevant to the discovery or production of geothermal energy

D. Authorizing Statutes

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The programmatic authorizing statute is EPAct 2005, Section 931(a)(2)(C)

Awards made under this announcement will fall under the purview of 2 CFR Part 200 as amended by 2 CFR Part 910.

II. Award Information

A. Award Overview

i. Estimated Funding

EERE expects to make approximately $3.6M of Federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making approximately 5-7 awards under this FOA. EERE may issue one, multiple, or no awards. Individual awards may vary between $500,000 and $700,000.

EERE may issue awards in one or both of the following topic areas:

Topic 1: Machine Learning for Geothermal Exploration: EERE may issue approximately 4-5 awards in this topic area, with an average award amount of $500,000.

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Topic 2: Advanced Analytics for Efficiency and Automation in Geothermal Operations: EERE may issue approximately 1-3 awards in this topic area, with an average award amount of $500,000.

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EERE may establish more than one budget period for each award and fund only the initial budget period(s). Funding for all budget periods, including the initial budget period, is not guaranteed. Before the expiration of the initial budget period(s), EERE may perform a down-select among different recipients and provide additional funding only to a subset of recipients.

ii. Period of Performance

EERE anticipates making awards that will run up to 24 months in length, comprised of one or more budget periods. Project continuation will be contingent upon satisfactory performance and go/no-go decision review. At the go/no-go decision points, EERE will evaluate project performance, project schedule adherence, meeting milestone objectives, compliance with reporting requirements, and overall contribution to the program goals and objectives. As a result of this evaluation, EERE will make a determination to continue the project, re-direct the project, or discontinue funding the project.

iii. New Applications Only

EERE will accept only new applications under this FOA. EERE will not consider applications for renewals of existing EERE-funded awards through this FOA.

B. EERE Funding Agreements

Through Cooperative Agreements and other similar agreements, EERE provides financial and other support to projects that have the potential to realize the FOA

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objectives. EERE does not use such agreements to acquire property or services for the direct benefit or use of the United States Government.

i. Cooperative Agreements

EERE generally uses Cooperative Agreements to provide financial and other support to Prime Recipients.

Through Cooperative Agreements, EERE provides financial or other support to accomplish a public purpose of support or stimulation authorized by Federal statute. Under Cooperative Agreements, the Government and Prime Recipients share responsibility for the direction of projects.

EERE has substantial involvement in all projects funded via Cooperative Agreement. See Section VI.B.9 of the FOA for more information on what substantial involvement may involve.

ii. Funding Agreements with FFRDCs

In most cases, Federally Funded Research and Development Centers (FFRDC) are funded independently of the remainder of the Project Team. The FFRDC then executes an agreement with any non-FFRDC Project Team members to arrange work structure, project execution, and any other matters. Regardless of these arrangements, the entity that applied as the Prime Recipient for the project will remain the Prime Recipient for the project.

iii. Grants

Although EERE has the authority to provide financial support to Prime Recipients through Grants, EERE generally does not fund projects through Grants. EERE may fund a limited number of projects through Grants, as appropriate.

iv. Technology Investment Agreements

In rare cases and if determined appropriate, EERE will consider awarding a Technology Investment Agreement (TIA) to a non-FFRDC applicant. TIAs, governed by 10 CFR Part 603, are assistance instruments used to increase the involvement of commercial entities in the Department's research, development, and demonstration programs. A TIA may be either a type of cooperative agreement or an assistance transaction other than a cooperative agreement, depending on the intellectual property provisions. In both cases, TIAs are not necessarily subject to all of the requirements of 2 CFR Part 200 as amended by 2 CFR Part 910.

In a TIA, EERE may modify the standard Government terms and conditions, including but not limited to:

- Intellectual Property Provisions: EERE may negotiate special arrangements with recipients to avoid the encumbrance of existing intellectual property rights or to facilitate the commercial deployment of inventions conceived or first actually reduced to practice under the EERE funding agreement.
- Accounting Provisions: EERE may authorize the use of generally accepted accounting principles (GAAP) where recipients do not have accounting systems that comply with Government recordkeeping and reporting requirements.

EERE will be more amenable to awarding a TIA in support of an application from a consortium or a team arrangement that includes cost sharing with the private sector, as opposed to an application from a single organization. Such a consortium or teaming arrangement could include a FFRDC. If a DOE/NNSA FFRDC is a part of the consortium or teaming arrangement, the value of, and funding for the DOE/NNSA FFRDC portion of the work will be authorized and funded under the DOE field work authorization system and performed under the laboratory's Management and Operating contract. Funding for a non-DOE/NNSA FFRDC would be through an interagency agreement under the Economy Act or other statutory authority. Other appropriate contractual accommodations, such as those involving intellectual property, may be made through a "funds in" agreement to facilitate the FFRDCs participation in the consortium or teaming arrangement. If a TIA is awarded, certain types of information described in 10 CFR 603.420(b) are exempt from disclosure under the Freedom of Information Act for five years after DOE receives the information.

An applicant may request a TIA if it believes that using a TIA could benefit the RD&D objectives of the program (see section 603.225) and can document these benefits. If an applicant is seeking to negotiate a TIA, the applicant must include an explicit request in its Full Application. After an applicant is selected for award negotiation, the Contracting Officer will determine if awarding a TIA would benefit the RD&D objectives of the program in ways that likely would not happen if another type of assistance agreement (e.g., cooperative agreement subject to the requirements of 2 CFR Part 200 as amended by 2 CFR Part 910). The Contracting Officer will use the criteria in 10 CFR 603, Subpart B, to make this determination.

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III. Eligibility Information

To be considered for substantive evaluation, an applicant's submission must meet the criteria set forth below. If the application does not meet these initial requirements, it will be considered non-responsive, removed from further evaluation, and ineligible for any award.

A. Eligible Applicants

i. Individuals

U.S. citizens and lawful permanent residents are eligible to apply for funding as a Prime Recipient or Subrecipient.

ii. Domestic Entities

For-profit entities, educational institutions, and nonprofits that are incorporated (or otherwise formed) under the laws of a particular State or territory of the United States are eligible to apply for funding as a Prime Recipient or Subrecipient. Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995, are not eligible to apply for funding.

State, local, and tribal government entities are eligible to apply for funding as a Prime Recipient or Subrecipient.

DOE/NNSA Federally Funded Research and Development Centers (FFRDCs) are eligible to apply for funding as a Prime Recipient or Subrecipient.

Non-DOE/NNSA FFRDCs are eligible to apply for funding as a Subrecipient, but are not eligible to apply as a Prime Recipient.

Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a Subrecipient, but are not eligible to apply as a Prime Recipient.

iii. Foreign Entities

Foreign entities, whether for-profit or otherwise, are eligible to apply for funding under this FOA. Other than as provided in the "Individuals" or "Domestic Entities" sections above, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. If a foreign entity applies for

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funding as a Prime Recipient, it must designate in the Full Application a subsidiary or affiliate incorporated (or otherwise formed) under the laws of a State or territory of the United States to be the Prime Recipient. The Full Application must state the nature of the corporate relationship between the foreign entity and domestic subsidiary or affiliate.

Foreign entities may request a waiver of the requirement to designate a subsidiary in the United States as the Prime Recipient in the Full Application (i.e., a foreign entity may request that it remains the Prime Recipient on an award). To do so, the Applicant must submit an explicit written waiver request in the Full Application. Appendix C lists the necessary information that must be included in a request to waive this requirement. The applicant does not have the right to appeal EERE's decision concerning a waiver request.

In the waiver request, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the Prime Recipient. EERE may require additional information before considering the waiver request.

A foreign entity may receive funding as a Subrecipient.

iv. Incorporated Consortia

Incorporated consortia, which may include domestic and/or foreign entities, are eligible to apply for funding as a Prime Recipient or Subrecipient. For consortia incorporated (or otherwise formed) under the laws of a State or territory of the United States, please refer to "Domestic Entities" above. For consortia incorporated in foreign countries, please refer to the requirements in "Foreign Entities" above.

Each incorporated consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium must provide a written description of its internal governance structure and its internal rules to the EERE Contracting Officer.

v. Unincorporated Consortia

Unincorporated Consortia, which may include domestic and foreign entities, must designate one member of the consortium to serve as the Prime Recipient/consortium representative. The Prime Recipient/consortium representative must be incorporated (or otherwise formed) under the laws

of a State or territory of the United States. The eligibility of the consortium will be determined by the eligibility of the Prime Recipient/consortium representative under Section III.A of the FOA.

Upon request, unincorporated consortia must provide the EERE Contracting Officer with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each consortium member. This agreement binds the individual consortium members together and should discuss, among other things, the consortium's:

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members' efforts on the project;
- Provisions for members' cost sharing contributions; and
- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

B. Cost Sharing

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Cost Share 20%, Cost Share Waiver Not Utilized
The cost share must be at least 20% of the total allowable costs for research and development projects (i.e., the sum of the Government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) and must come from non-Federal sources unless otherwise allowed by law. (See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.)

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To assist applicants in calculating proper cost share amounts, EERE has included a cost share information sheet and sample cost share calculation as Appendices B and C to this FOA.

i. Legal Responsibility

Although the cost share requirement applies to the project as a whole, including work performed by members of the project team other than the Prime Recipient, the Prime Recipient is legally responsible for paying the entire cost share. The Prime Recipient's cost share obligation is expressed in the Assistance Agreement as a static amount in U.S. dollars (cost share amount) and as a percentage of the Total Project Cost (cost share percentage). If the funding agreement is terminated prior to the end of the

project period, the Prime Recipient is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination.

The Prime Recipient is solely responsible for managing cost share contributions by the Project Team and enforcing cost share obligation assumed by Project Team members in subawards or related agreements.

ii. Cost Share Allocation

Each Project Team is free to determine how best to allocate the cost share requirement among the team members. The amount contributed by individual Project Team members may vary, as long as the cost share requirement for the project as a whole is met.

iii. Cost Share Types and Allowability

Every cost share contribution must be allowable under the applicable Federal cost principles, as described in Section IV.J.1 of the FOA. In addition, cost share must be verifiable upon submission of the Full Application.

Project Teams may provide cost share in the form of cash or in-kind contributions. Cost share may be provided by the Prime Recipient, Subrecipients, or third parties (entities that do not have a role in performing the scope of work). Vendors/Contractors may not provide cost share. Any partial donation of goods or services is considered a discount and is not allowable.

Cash contributions include, but are not limited to: personnel costs, fringe costs, supply and equipment costs, indirect costs and other direct costs.

In-kind contributions are those where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. Allowable in-kind contributions include, but are not limited to: the donation of volunteer time or the donation of space or use of equipment.

Project teams may use funding or property received from state or local governments to meet the cost share requirement, so long as the funding was not provided to the state or local government by the Federal Government.

The Prime Recipient may not use the following sources to meet its cost share obligations including, but not limited to:

- Revenues or royalties from the prospective operation of an activity beyond the project period;
- Proceeds from the prospective sale of an asset of an activity;
- Federal funding or property (e.g., Federal grants, equipment owned by the Federal Government); or
- Expenditures that were reimbursed under a separate Federal Program.

Project Teams may not use the same cash or in-kind contributions to meet cost share requirements for more than one project or program.

Cost share contributions must be specified in the project budget, verifiable from the Prime Recipient's records, and necessary and reasonable for proper and efficient accomplishment of the project. As all sources of cost share are considered part of total project cost, the cost share dollars will be scrutinized under the same Federal regulations as Federal dollars to the project. Every cost share contribution must be reviewed and approved in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred.

Applicants are encouraged to refer to 2 CFR 200.306 as amended by 2 CFR 910.130 & 10 CFR 603.525-555 for additional guidance on cost sharing.

iv. Cost Share Contributions by FFRDCs

Because FFRDCs are funded by the Federal Government, costs incurred by FFRDCs generally may not be used to meet the cost share requirement. FFRDCs may contribute cost share only if the contributions are paid directly from the contractor's Management Fee or another non-Federal source.

v. Cost Share Verification

Applicants are required to provide written assurance of their proposed cost share contributions in their Full Applications.

Upon selection for award negotiations, applicants are required to provide additional information and documentation regarding their cost share contributions. Please refer to Appendix A of the FOA.

vi. Cost Share Payment

EERE requires Prime Recipients to contribute the cost share amount incrementally over the life of the award. Specifically, the Prime Recipient's cost share for each billing period must always reflect the overall cost share ratio negotiated by the parties (i.e., the total amount of cost sharing on each invoice when considered cumulatively with previous invoices must reflect, at a minimum, the cost sharing percentage negotiated). As FFRDC funding will be provided directly to the FFRDC(s) by DOE, Prime Recipients will be required to provide project cost share at a percentage commensurate with the FFRDC costs, on a budget period basis, resulting in a higher interim invoicing cost share ratio than the total award ratio.

In limited circumstances, and where it is in the government's interest, the EERE Contracting Officer may approve a request by the Prime Recipient to meet its cost share requirements on a less frequent basis, such as monthly or quarterly. Regardless of the interval requested, the Prime Recipient must be up-to-date on cost share at each interval. Such requests must be sent to the Contracting Officer during award negotiations and include the following information: (1) a detailed justification for the request; (2) a proposed schedule of payments, including amounts and dates; (3) a written commitment to meet that schedule; and (4) such evidence as necessary to demonstrate that the Prime Recipient has complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they go into effect.

C. Compliance Criteria

Concept Papers and Full Applications must meet all Compliance criteria listed below or they will be considered noncompliant. EERE will not review or consider noncompliant submissions, including Concept Papers, Full Applications, and Replies to Reviewer Comments that were: submitted through means other than EERE Exchange; submitted after the applicable deadline; and/or submitted incomplete. EERE will not extend the submission deadline for applicants that fail to submit required information due to server/connection congestion.

i. Compliance Criteria

1. **Concept Papers**
   Concept Papers are deemed compliant if:

   - The Concept Paper complies with the content and form requirements in Section IV.C of the FOA; and

- The applicant successfully uploaded all required documents and clicked the "Submit" button in EERE Exchange by the deadline stated in this FOA.

2. **Full Applications**
   Full Applications are deemed compliant if:

   - The applicant submitted a compliant Concept Paper;
   - The Full Application complies with the content and form requirements in Section IV.D of the FOA; and
   - The applicant successfully uploaded all required documents and clicked the "Submit" button in EERE Exchange by the deadline stated in the FOA.

3. **Replies to Reviewer Comments**
   Replies to Reviewer Comments are deemed compliant if:

   - The Reply to Reviewer Comments complies with the content and form requirements in Section IV.E of the FOA; and
   - The applicant successfully uploaded all required documents to EERE Exchange by the deadline stated in the FOA.

D. Responsiveness Criteria

All "Applications Specifically Not of Interest," as described in Section I.C of the FOA, are deemed nonresponsive and are not reviewed or considered.

E. Other Eligibility Requirements

i. Requirements for DOE/NNSA Federally Funded Research and Development Centers (FFRDC) Listed as the Applicant

A DOE/NNSA FFRDC is eligible to apply for funding under this FOA if its cognizant Contracting Officer provides written authorization and this authorization is submitted with the application. If a DOE/NNSA FFRDC is selected for award negotiation, the proposed work will be authorized under the DOE work authorization process and performed under the laboratory's Management and Operating (M&O) contract.

The following wording is acceptable for the authorization:

Authorization is granted for the [Enter Laboratory Name][Enter Laboratory Name][Enter Laboratory Name] Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

ii. Requirements for DOE/NNSA and non-DOE/NNSA Federally Funded Research and Development Centers Included as a Subrecipient

DOE/NNSA and non-DOE/NNSA FFRDCs may be proposed as a Subrecipient on another entity's application subject to the following guidelines:

1. **Authorization for non-DOE/NNSA FFRDCs**
   The Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with its authority under its award.

2. **Authorization for DOE/NNSA FFRDCs**
   The cognizant Contracting Officer for the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The following wording is acceptable for this authorization:

   Authorization is granted for the [Enter Laboratory Name] Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

3. **Value/Funding**
   The value of and funding for the FFRDC portion of the work will not normally be included in the award to a successful applicant. Usually, DOE will fund a DOE/NNSA FFRDC contractor through the DOE field work proposal system and non-DOE/NNSA FFRDC through an interagency agreement with the sponsoring agency.

4. **Cost Share**
   Although the FFRDC portion of the work is usually excluded from the award to a successful applicant, the applicant's cost share requirement

will be based on the total cost of the project, including the applicant's and the FFRDC's portions of the project.

5. **Responsibility**
   The Prime Recipient will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues including, but not limited to disputes and claims arising out of any agreement between the Prime Recipient and the FFRDC contractor.

6. **Limit on FFRDC Effort**
   The FFRDC effort, in aggregate, shall not exceed 50% of the total estimated cost of the project, including the applicant's and the FFRDC's portions of the effort.

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F. Limitation on Number of Concept Papers and Full Applications Eligible for Review

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Applicants may only submit one Concept Paper and one Full Application for each topic area of this FOA. If an applicant submits more than one Concept Paper or Full Application to the same topic area, EERE will only consider the last timely submission for evaluation. Any other submissions received listing the same applicant for the same topic area will be considered noncompliant and not eligible for further consideration. This limitation does not prohibit an applicant from collaborating on other applications (e.g., as a potential Subrecipient or partner) so long as the entity is only listed as the prime applicant on one Full Application submitted under this FOA.

G. Questions Regarding Eligibility

EERE will not make eligibility determinations for potential applicants prior to the date on which applications to this FOA must be submitted. The decision whether to submit an application in response to this FOA lies solely with the applicant.

IV. Application and Submission Information

A. Application Process

The application process will include two phases: a Concept Paper phase and a Full Application phase. **Only applicants who have submitted an eligible Concept Paper will be eligible to submit a Full Application**. At each phase, EERE performs an initial eligibility review of the applicant submissions to determine whether they meet the eligibility requirements of Section III of the FOA. EERE will not review or

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consider submissions that do not meet the eligibility requirements of Section III. All submissions must conform to the following form and content requirements, including maximum page lengths (described below) and must be submitted via EERE Exchange at https://eere-exchange.energy.gov/, unless specifically stated otherwise. **EERE will not review or consider submissions submitted through means other than EERE Exchange, submissions submitted after the applicable deadline, and incomplete submissions**. EERE will not extend deadlines for applicants who fail to submit required information and documents due to server/connection congestion. A control number will be issued when an applicant begins the EERE Exchange application process. This control number must be included with all Application documents, as described below.

The Concept Paper, Full Application, and Reply to Reviewer Comments must conform to the following requirements:

- Each must be submitted in Adobe PDF format unless stated otherwise.
- Each must be written in English.
- All pages must be formatted to fit on 8.5 x 11 inch paper with margins not less than one inch on every side. Use Times New Roman typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement.
- The Control Number must be prominently displayed on the upper right corner of the header of every page. Page numbers must be included in the footer of every page.
- Each submission must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

Applicants are responsible for meeting each submission deadline. **Applicants are strongly encouraged to submit their Concept Papers and Full Applications at least 48 hours in advance of the submission deadline**. Under normal conditions (i.e., at least 48 hours in advance of the submission deadline), applicants should allow at least 1 hour to submit a Concept Paper, Full Application, or Reply to Reviewer Comments. Once the Concept Paper, Full Application, or Reply to

Reviewer Comments is submitted in EERE Exchange, applicants may revise or update that submission until the expiration of the applicable deadline. If changes are made, the applicant must resubmit the Concept Paper, Full Application, or Reply to Reviewer Comments before the applicable deadline.

EERE urges applicants to carefully review their Concept Papers, and Full Applications and to allow sufficient time for the submission of required information and documents. All Full Applications that pass the initial eligibility review will undergo comprehensive technical merit review according to the criteria identified in Section V.A.2 of the FOA.

i. Additional Information on EERE Exchange

EERE Exchange is designed to enforce the deadlines specified in this FOA. The "Apply" and "Submit" buttons will automatically disable at the defined submission deadlines. Should applicants experience problems with EERE Exchange, the following information may be helpful.

Applicants that experience issues with submission PRIOR to the FOA deadline: In the event that an applicant experiences technical difficulties with a submission, the Application should contact the EERE Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The EERE Exchange helpdesk and/or the EERE Exchange system administrators will assist Applicants in resolving issues.

Applicants that experience issue with submissions that result in late submissions: In the event that an applicant experiences technical difficulties so severe that they are unable to submit their application by the deadline, the applicant should contact the EERE Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The EERE Exchange helpdesk and/or the EERE Exchange system administrators will assist the applicant in resolving all issues (including finalizing submission on behalf of and with the applicant's concurrence). PLEASE NOTE, however, those applicants who are unable to submit their application on time due to their waiting until the last minute when network traffic is at its heaviest to submit their materials will not be able to use this process.

B. Application Forms

The application forms and instructions are available on EERE Exchange. To access these materials, go to https://eere-Exchange.energy.gov and select the appropriate funding opportunity number.

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA, it must be broken into parts and denoted to that effect. For example:
ControlNumber_LeadOrganization_Project_Part_1
ControlNumber_LeadOrganization_Project_Part_2, etc.

C. Content and Form of the Concept Paper

To be eligible to submit a Full Application, applicants must submit a Concept Paper by the specified due date and time.

i. Concept Paper Content Requirements

EERE will not review or consider ineligible Concept Papers (see Section III of the FOA).

Each Concept Paper must be limited to a single concept or technology. Unrelated concepts and technologies should not be consolidated into a single Concept Paper.

The Concept Paper must conform to the following content requirements:

Section	Page Limit	Description
Cover Page	1 page maximum	The cover page should include the project title, the specific FOA Topic Area being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Technology Description	1 page maximum	Applicants are required to describe succinctly: • The proposed technology, including its basic operating principles and how it is unique and innovative; • The proposed technology's target level of performance (applicants should provide technical data or other support to show how the proposed target could be met); • The current state-of-the-art in the relevant field and application, including key shortcomings, limitations, and challenges; • The data sources that will be used in the project

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		• How the proposed technology will overcome the shortcomings, limitations, and challenges in the relevant field and application; • The potential impact that the proposed project would have on the relevant field and application; • The key technical risks/issues associated with the proposed technology development plan; and • The impact that EERE funding would have on the proposed project.
Addendum	1 page maximum	Applicants are required to describe succinctly the qualifications, experience, and capabilities of the proposed Project Team, including: • Whether the Principal Investigator (PI) and Project Team have the skill and expertise needed to successfully execute the project plan; • Whether the applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity; • Whether the applicant has worked together with its teaming partners on prior projects or programs; and • Whether the applicant has adequate access to equipment and facilities necessary to accomplish the effort and/or clearly explain how it intends to obtain access to the necessary equipment and facilities. Applicants may provide graphs, charts, or other data to supplement their Technology Description.

EERE makes an independent assessment of each Concept Paper based on the criteria in Section V.A.i of the FOA. EERE will encourage a subset of applicants to submit Full Applications. Other applicants will be discouraged from submitting a Full Application. An applicant who receives a "discouraged" notification may still submit a Full Application. EERE will review all eligible Full Applications. However, by discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project in an effort to save the applicant the time and expense of preparing an application that is unlikely to be selected for award negotiations.

EERE may include general comments provided from reviewers on an applicant's Concept Paper in the encourage/discourage notification posted on EERE Exchange at the close of that phase.

D. Content and Form of the Full Application

Applicants must submit a Full Application by the specified due date and time to be considered for funding under this FOA. Applicants must complete the following application forms found on the EERE Exchange website at https://eere-Exchange.energy.gov/, in accordance with the instructions.

Applicants will have approximately 30 days from receipt of the Concept Paper Encourage/Discourage notification on EERE Exchange to prepare and submit a Full Application. Regardless of the date the applicant receives the Encourage/Discourage notification, the submission deadline for the Full Application remains the date and time stated on the FOA cover page.

All Full Application documents must be marked with the Control Number issued to the applicant. Applicants will receive a control number upon submission of their Concept Paper, and should include that control number in the file name of their Full Application submission (i.e., Control number_Applicant Name_Full Application)."Applicants will receive a control number upon submission of their Concept Paper, and should include that control number in the file name of their Full Application submission (i.e., Control number_Applicant Name_Full Application)."control number upon submission of their Concept Paper, and should include that control number in the file name of their Full Application submission (i.e., Control number_Applicant Name_Full Application)."Applicants will receive a control number upon submission of their Concept Paper, and should include that control number in the file name of their Full Application submission (i.e., Control number_Applicant Name_Full Application)."Applicants will receive a

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"Applicants will receive a control number upon submission of their Letter of Intent, and should include that control number in the file name of their Full Application submission (i.e., *Control number_Applicant Name_Full Application*)."

If the applicant will be issued a Control Number upon submission of their Concept Paper, replace the highlighted text with the following:

"Applicants will receive a control number upon submission of their Concept Paper, and should include that control number in the file name of their Full Application submission (i.e., *Control number_Applicant Name_Full Application*)."

i. Full Application Content Requirements

EERE will not review or consider ineligible Full Applications (see Section III of the FOA).

Each Full Application shall be limited to a single concept or technology. Unrelated concepts and technologies shall not be consolidated in a single Full Application.

Full Applications must conform to the following requirements:

Submission	Components	File Name
Full Application	Technical Volume (See Chart in Section IV.D.2)	ControlNumber_LeadOrganization_TechnicalVolume

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(PDF, unless stated otherwise)	Statement of Project Objectives (Microsoft Word format) (5 page limit)	ControlNumber_LeadOrganization_SOPO
	SF-424	ControlNumber_LeadOrganization_App424
	Budget Justification (EERE 335) (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Budget_Justification
	Summary for Public Release (1 page limit)	ControlNumber_LeadOrganization_Summary
	Summary Slide (1 page limit, Microsoft PowerPoint format)	ControlNumber_LeadOrganization_Slide
	Subrecipient Budget Justification, if applicable (EERE 335) (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
	Budget for FFRDC, if applicable	ControlNumber_LeadOrganization_FWP
	Authorization from cognizant Contracting Officer for FFRDC, if applicable	ControlNumber_LeadOrganization_FFRDCAuth
	SF-LLL Disclosure of Lobbying Activities	ControlNumber_LeadOrganization_SF-LLL
	Foreign Entity and Performance of Work in the United States waiver requests, if applicable	ControlNumber_LeadOrganization_Waiver
	Data Management Plan	ControlNumber_LeadOrganization_DMP

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Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA it must be broken into parts and denoted to that effect. For example:

ControlNumber_LeadOrganization_TechnicalVolume_Part_1
ControlNumber_LeadOrganization_TechnicalVolume_Part_2, etc.

EERE will not accept late submissions that resulted from technical difficulties due to uploading files that exceed 10MB.

EERE provides detailed guidance on the content and form of each component below.

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ii. Technical Volume

The Technical Volume must be submitted in Adobe PDF format. The Technical Volume must conform to the following content and form

requirements, including maximum page lengths. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages. This volume must address the Merit Review Criteria as discussed in Section V.A.2 of the FOA. Save the Technical Volume in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_TechnicalVolume".

Applicants must provide sufficient citations and references to the primary research literature to justify the claims and approaches made in the Technical Volume. However, EERE and reviewers are under no obligation to review cited sources.

The Technical Volume to the Full Application may not be more than 10 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.2 of the FOA) when preparing the Technical Volume.

Commented [TEM31]: FOA Managers may delete the page numbers for their FOA. Note that the Technical Volume sets recommended percentages of space that the Applicant should devote to each section, so this number should be chosen carefully (i.e., not "unlimited"). Feel free to adjust the recommended percentages for each section, but be sure they add up to 100% to avoid applicant confusion.

SECTION/PAGE LIMIT	DESCRIPTION
	The cover page should include the project title, the specific FOA Topic Area being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Project Overview (This section should constitute approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.

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Technical Description, Innovation, and Impact (This section should constitute approximately 30% of the Technical Volume)	The Technical Description should contain the following information: • Relevance and Outcomes: The applicant should provide a detailed description of the technology, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. The datasets (and their sources) that will be utilized on the project should also be described here, along with a description of the applicant's permission to use the datasets (e.g., an executed nondisclosure agreement or other contractual instrument). • Innovation and impacts: The applicant should describe the current state of the art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies, and the overall impact on advancing the state of the art/technical baseline if the project is successful.
Workplan and Market Transformation Plan (This section should constitute approximately 40% of the Technical Volume)	The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure, Milestones, Go/No-Go Decision Points, and Project Schedule. A detailed Statement of Project Objectives (SOPO) is separately requested. The Workplan should contain the following information: • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on go/no-go decision points). The applicant should describe the specific expected end result of each performance period. • Work Breakdown Structure (WBS) and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard work breakdown structure (WBS) for any project.

	The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO. • Go/No-Go Decision Points: The applicant should provide a summary of project-wide go/no-go decision points at appropriate points in the Workplan. A go/no-go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one project-wide go/no-go decision point for each budget period (12 to 18-month period) of the project. The Applicant should also provide the specific technical criteria to be used to make the go/no-go decision. The summary provided should be consistent with the SOPO. Go/no-go decision points are considered "SMART" and can fulfill the requirement for an annual SMART milestone. • End of Project Goal: The applicant should provide a summary of the end of project goal(s). Unless otherwise specified in the FOA, the minimum requirement is that each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO.

	• Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and go/no-go decision points. • Project Management: The applicant should discuss the team's proposed management plan, including the following: o The overall approach to and organization for managing the work o The roles of each Project Team member o Any critical handoffs/interdependencies among Project Team members o The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices o The approach to project risk management o A description of how project changes will be handled o If applicable, the approach to Quality Assurance/Control o How communications will be maintained among Project Team members • Market Transformation Plan: The applicant should provide a market transformation plan, including the following: o Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan o Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, and product distribution.
Technical Qualifications and Resources (Approximately 20% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information: • Describe the Project Team's unique qualifications and expertise, including those of key Subrecipients. • Describe the Project Team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project.

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	• Attach one-page resumes for key participating team members as an appendix. Resumes do not count towards the page limit. Multi-page resumes are not allowed.
	• Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable.
	• Attach letters of commitment from all Subrecipient/third party cost share providers as an appendix. Letters of commitment do not count towards the page limit.
	• Attach any letters of commitment from partners/end users as an appendix (1 page maximum per letter). Letters of commitment do not count towards the page limit.
	• For multi-organizational or multi-investigator projects, describe succinctly:
	  o The roles and the work to be performed by each PI and Key Participant;
	  o Business agreements between the applicant and each PI and Key Participant;
	  o How the various efforts will be integrated and managed;
	  o Process for making decisions on scientific/technical direction;
	  o Publication arrangements;
	  o Intellectual Property issues; and
	  o Communication plans

iii. Statement of Project Objectives

Applicants are required to complete a Statement of Project Objectives (SOPO). A SOPO template is available on EERE Exchange at https://eere-Exchange.energy.gov/. The SOPO, including the Milestone Table, must not exceed 5 pages when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the SOPO in a single Microsoft Word file using the following convention for the title "ControlNumber_LeadOrganization_SOPO".

Commentbell [TEN34]: FOA Managers may change the page maximum for their FOA.

iv. SF-424: Application for Federal Assistance

Complete all required fields in accordance with the instructions on the form. The list of certifications and assurances in Field 21 can be found at http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms, under Certifications and Assurances. Note: The dates and dollar amounts on the SF-424 are for the complete project period and not just the first project year, first phase or other subset of the project period. Save the SF-424 in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_App424".

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v. Budget Justification Workbook (EERE 335)

Applicants are required to complete the Budget Justification Workbook. This form is available on EERE Exchange at https://eere-Exchange.energy.gov/. Prime Recipients must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the Prime Recipient and its Subrecipients and Contractors, and provide all requested documentation (e.g., a Federally-approved rate agreement, vendor quotes). Applicants should include costs associated with required annual audits and incurred cost proposals in their proposed budget documents. The "Instructions and Summary" included with the Budget Justification Workbook will auto-populate as the applicant enters information into the Workbook. Applicants must carefully read the "Instructions and Summary" tab provided within the Budget Justification Workbook. Save the Budget Justification Workbook in a single Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Budget_Justification".

vi. Summary/Abstract for Public Release

Applicants are required to submit a one-page summary/abstract of their project. The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (e.g., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as DOE may make it available to the public after selections are made. The project summary must not exceed 1 page when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the Summary for Public Release in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Summary".

vii. Summary Slide

Applicants are required to provide a single PowerPoint slide summarizing the proposed project. The slide must be submitted in Microsoft PowerPoint format. This slide is used during the evaluation process. Save the Summary Slide in a single file using the following convention for the title "ControlNumber_LeadOrganization_Slide".

The Summary Slide template requires the following information:

- A technology Summary;
- A description of the technology's impact;
- Proposed project goals;
- Any key graphics (illustrations, charts and/or tables);
- The project's key idea/takeaway;
- Project title, Prime Recipient, Principal Investigator, and Key Participant information; and
- Requested EERE funds and proposed applicant cost share.

viii. Subrecipient Budget Justification (EERE 335) (if applicable)

Applicants must provide a separate budget justification, EERE 335 (i.e., budget justification for each budget year and a cumulative budget) for each subrecipient that is expected to perform work estimated to be more than $250,000 or 25 percent of the total work effort (whichever is less). The budget justification must include the same justification information described in the "Budget Justification" section above. Save each subrecipient budget justification in a Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Subrecipient_Budget_Justification".

ix. Budget for DOE/NNSA FFRDC (if applicable)

If a DOE/NNSA FFRDC contractor is to perform a portion of the work, the applicant must provide a DOE Field Work Proposal (FWP) in accordance with the requirements in DOE Order 412.1, Work Authorization System. DOE Order 412.1 and DOE O 412.1 (Field Work Proposal form) area available at the following link, under "DOE Budget Forms": https://www.directives.doe.gov/directives-documents/400-series/0412.1-BOrder-a-admchg1/@@images/file. Save the FWP in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FWP".

x. Authorization for non-DOE/NNSA or DOE/NNSA FFRDCs (if applicable)

The Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with the contractor's authority under its award. Save the Authorization in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FFRDCAuth".

xi. SF-LLL: Disclosure of Lobbying Activities (required)

Prime Recipients and Subrecipients may not use any Federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Prime Recipients and Subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to ensure that non-Federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with your application:

- An officer or employee of any Federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

Save the SF-LLL in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_SF-LLL".

xii. Waiver Requests: Foreign Entities and Performance of Work in the United States (if applicable)

1. **Foreign Entity Participation:**
   As set forth in Section III.A.3, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. To request a waiver of this requirement, the applicant must submit an explicit waiver request in the Full Application. Appendix C lists the necessary information that must be included in a request to waive this requirement.

2. **Performance of Work in the United States**
   As set forth in Section IV.K.iii, all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. Appendix C lists the necessary information that must be included in a request to waive the Performance of Work in the United

States requirement.

xiii. U.S. Manufacturing Commitments

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EERE requires subject inventions (i.e., inventions conceived or first actually reduced to practice under EERE awards) to be substantially manufactured in the United States by Project Teams and their licensees, as described below. The applicant may request a modification or waiver of the U.S. Manufacturing Requirement.

1. **Domestic Small Businesses, Educational Institutions and Nonprofits**
   Domestic Small businesses (including Small Business concerns), domestic educational institutions, and nonprofits that are Recipients or Subrecipients under EERE funding agreements must require their exclusive licensees to substantially manufacture the following products in the United States for any use or sale in the United States: (1) articles embodying subject inventions, and (2) articles produced through the use of subject inventions. This requirement does not apply to articles that are manufactured for use or sale overseas.

   Domestic small businesses, domestic educational institutions and nonprofits must require their assignees to apply the same U.S. Manufacturing requirements to their exclusive licensees.

   These U.S. Manufacturing requirements do not apply to nonexclusive licensees.

2. **Large Businesses, Foreign Entities, and State and Local Government Entities**
   Large businesses and foreign entities that are Recipients or Subrecipients under EERE funding agreements that take title to subject inventions through a patent waiver are required to substantially manufacture the following products in the United States: (1) products embodying subject inventions, and (2) products produced through the use of subject invention(s). This requirement applies to products that are manufactured for use or sale in the United States or overseas.

   Large businesses and foreign entities must apply the same U.S. Manufacturing requirements to their assignees, licensees, and entities acquiring a controlling interest in the large business or foreign

entity. Large businesses and foreign entities must require their assignees and entities acquiring a controlling interest in the large business or foreign entity to apply the same U.S. Manufacturing requirements to their licensees.

3. **FFRDCs**
   DOE FFRDCs are subject to the U.S. Manufacturing requirements set forth in their Management and Operating Contracts. All other FFRDCs are subject to the U.S. Manufacturing requirements as set forth above, based on their size and for-profit status.

xiv. Data Management Plan

Applicants are required to submit a Data Management Plan with their Full Application. The Data Management Plan is a document that outlines the proposed plan for data sharing or preservation. Submission of a Data Management Plan with the Full Application is required; failure to submit a complete Data Management Plan may result in a determination of non-compliance for your Full Application. Guidance for preparing a Data Management Plan is included in Appendix D of the FOA.

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xv. Additional Requirements

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E. Content and Form of Replies to Reviewer Comments

EERE will provide applicants with reviewer comments following evaluation of all eligible Full Applications. Applicants will have a brief opportunity to review the comments and to prepare a short Reply to Reviewer Comments responding to comments however they desire or supplementing their Full Application. The Reply to Reviewer Comments is an optional submission; applicants are not required to submit a Reply to Reviewer Comments. EERE will post the Reviewer Comments in EERE Exchange. The expected submission deadline is on the cover page of the FOA; however, it is the applicant's responsibility to monitor EERE Exchange in the event that the expected date changes. The deadline will not be extended for applicants who are unable to timely submit their reply due to failure to check EERE Exchange

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or relying on the expected date alone. Applicants should anticipate having approximately three (3) business days to submit Replies to Reviewer Comments.

EERE will not review or consider ineligible Replies to Reviewer Comments (see Section III of the FOA). EERE will review and consider each eligible Full Application, even if no Reply is submitted or if the Reply is found to be ineligible.

Replies to Reviewer Comments must conform to the following content and form requirements, including maximum page lengths, described below. If a Reply to Reviewer Comments is more than three pages in length, EERE will review only the first three (3) pages and disregard any additional pages.

SECTION	PAGE LIMIT	DESCRIPTION
Text	2 pages max	Applicants may respond to one or more reviewer comments or supplement their Full Application.
Optional	1 page max	Applicants may use this page however they wish; text, graphs, charts, or other data to respond to reviewer comments or supplement their Full Application are acceptable.

F. Post-Award Information Requests

If selected for award, EERE reserves the right to request additional or clarifying information for any reason deemed necessary, including but not limited to:

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- Indirect cost information
- Other budget information
- Commitment Letters from Third Parties Contributing to Cost Share, if applicable
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5)
- Representation of Limited Rights Data and Restricted Software, if applicable
- Environmental Questionnaire

G. Dun and Bradstreet Universal Numbering System Number and System for Award Management

Each applicant (unless the applicant is an individual or Federal awarding agency that is excepted from those requirements under 2 CFR §25.110(b) or (c), or has an exception approved by the Federal awarding agency under 2 CFR §25.110(d)) is

required to: (1) Be registered in the System for Award Management (SAM) at https://www.sam.gov before submitting its application; (2) provide a valid Dun and Bradstreet Universal Numbering System (DUNS) number in its application; and (3) continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency. DOE may not make a Federal award to an applicant until the applicant has complied with all applicable DUNS and SAM requirements and, if an applicant has not fully complied with the requirements by the time DOE is ready to make a Federal award, the DOE may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

H. Submission Dates and Times

Concept Papers, Full Applications, and Replies to Reviewer Comments must be submitted in EERE Exchange no later than 5 p.m. Eastern on the dates provided on the cover page of this FOA.

I. Intergovernmental Review

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This FOA is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

J. Funding Restrictions

i. Allowable Costs

All expenditures must be allowable, allocable, and reasonable in accordance with the applicable Federal cost principles.

Refer to the following applicable Federal cost principles for more information:

- FAR Part 31 for For-Profit entities; and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

ii. Pre-Award Costs

Selectees must request prior written approval to charge pre-award costs. Pre-award costs are those incurred prior to the effective date of the Federal

award directly pursuant to the negotiation and in anticipation of the Federal award where such costs are necessary for efficient and timely performance of the scope of work. Such costs are allowable only to the extent that they would have been allowable if incurred after the date of the Federal award and **only** with the written approval of the Federal awarding agency, through the Contracting Officer assigned to the award.

Pre-award costs cannot be incurred prior to the Selection Official signing the Selection Statement and Analysis. Pre-award costs can only be incurred if such costs would be reimbursable under the agreement if incurred after award.

Pre-Award expenditures are made at the Selectee's risk; EERE is not obligated to reimburse costs: (1) in the absence of appropriations; (2) if an award is not made; or (3) if an award is made for a lesser amount than the Selectee anticipated.

1. **Pre-Award Costs Related to National Environmental Policy Act (NEPA) Requirements**
   EERE's decision whether and how to distribute Federal funds under this FOA is subject to NEPA. Applicants should carefully consider and should seek legal counsel or other expert advice before taking any action related to the proposed project that would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to EERE completing the NEPA review process.

   EERE does not guarantee or assume any obligation to reimburse costs where the Prime Recipient incurred the costs prior to receiving written authorization from the Contracting Officer. If the applicant elects to undertake activities that may have an adverse effect on the environment or limit the choice of reasonable alternatives prior to receiving such written authorization from the Contracting Officer, the applicant is doing so at risk of not receiving Federal funding and such costs may not be recognized as allowable cost share. Likewise, if a project is selected for negotiation of award, and the Prime Recipient elects to undertake activities that are not authorized for Federal funding by the Contracting Officer in advance of EERE completing a NEPA review, the Prime Recipient is doing so at risk of not receiving Federal Funding and such costs may not be recognized as allowable cost share. Nothing contained in the pre-award cost reimbursement regulations or any pre-award costs approval letter from the Contracting Officer override these NEPA

requirements to obtain the written authorization from the Contracting Officer prior to taking any action that may have an adverse effect on the environment or limit the choice of reasonable alternatives.

iii. Performance of Work in the United States

1. **Requirement**
   All work performed under EERE Awards must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment; however, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. The Prime Recipient must flow down this requirement to its Subrecipients.

2. **Failure to Comply**
   If the Prime Recipient fails to comply with the Performance of Work in the United States requirement, EERE may deny reimbursement for the work conducted outside the United States and such costs may not be recognized as allowable recipient cost share. The Prime Recipient is responsible should any work under this Award be performed outside the United States, absent a waiver, regardless of if the work is performed by the Prime Recipient, Subrecipients, contractors or other project partners.

3. **Waiver**
   There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit a written waiver request to EERE. Appendix C lists the necessary information that must be included in a request to waive the Performance of Work in the United States requirement.

   The applicant must demonstrate to the satisfaction of EERE that a waiver would further the purposes of the FOA and is in the economic interests of the United States. EERE may require additional information before considering a waiver request. Save the waiver request(s) in a single PDF file titled "ControlNumber_PerformanceofWork_Waiver". The applicant does not have the right to appeal EERE's decision concerning a waiver request.

iv. Construction

Recipients are required to obtain written authorization from the Contracting Officer before incurring any major construction costs.

v. Foreign Travel

Commented [TEM43]: Choose the appropriate option.

If international travel is proposed for your project, please note that your organization must comply with the International Air Transportation Fair Competitive Practices Act of 1974 (49 USC 40118), commonly referred to as the "Fly America Act," and implementing regulations at 41 CFR 301-10.131 through 301-10.143. The law and regulations require air transport of people or property to, from, between, or within a country other than the United States, the cost of which is supported under this award, to be performed by or under a cost-sharing arrangement with a U.S. flag carrier, if service is available. Foreign travel costs are allowable only with the written prior approval of the Contracting Officer assigned to the award.

vi. Equipment and Supplies

To the greatest extent practicable, all equipment and products purchased with funds made available under this FOA should be American-made. This requirement does not apply to used or leased equipment.

Property disposition will be required at the end of a project if the current fair market value of property exceeds $5,000. The rules for property disposition are set forth in 2 CFR 200.310 – 200.316 as amended by 2 CFR 910.360.

vii. Lobbying

Recipients and Subrecipients may not use any Federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Recipients and Subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to ensure that non-Federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with your application:

- An officer or employee of any Federal agency;
- A Member of Congress;

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- An officer or employee of Congress; or
- An employee of a Member of Congress.

viii. Risk Assessment

Prior to making a Federal award, the DOE is required by 31 U.S.C. 3321 and 41 U.S.C. 2313 to review information available through any OMB-designated repositories of government-wide eligibility qualification or financial integrity information, such as SAM Exclusions and "Do Not Pay."

In addition, DOE evaluates the risk(s) posed by applicants before they receive Federal awards. This evaluation may consider: results of the evaluation of the applicant's eligibility; the quality of the application; financial stability; quality of management systems and ability to meet the management standards prescribed in this part; history of performance; reports and findings from audits; and the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-Federal entities.

In addition to this review, DOE must comply with the guidelines on government-wide suspension and debarment in 2 CFR 180, and must require non-Federal entities to comply with these provisions. These provisions restrict Federal awards, subawards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in Federal programs or activities.

ix. Invoice Review and Approval

DOE employs a risk-based approach to determine the level of supporting documentation required for approving invoice payments. Recipients may be required to provide some or all of the following items with their requests for reimbursement:

- Summary of costs by cost categories
- Timesheets or personnel hours report
- Invoices/receipts for all travel, equipment, supplies, contractual, and other costs
- UCC filing proof for equipment acquired with project funds by for-profit recipients and subrecipients
- Explanation of cost share for invoicing period
- Analogous information for some subrecipients
- Other items as required by DOE

V. Application Review Information

A. Technical Review Criteria

i. Concept Papers

Concept Papers are evaluated based on consideration the following factors. All sub-criteria are of equal weight.

Concept Paper Criterion: Overall FOA Responsiveness and Viability of the Project (Weight: 100%)

- The applicant clearly describes the proposed technology, describes how the technology is unique and innovative, and how the technology will advance the current state-of-the-art;
- The applicant has identified risks and challenges, including possible mitigation strategies, and has shown the impact that EERE funding and the proposed project would have on the relevant field and application;
- The applicant has the qualifications, experience, capabilities and other resources necessary to complete the proposed project; and
- The proposed work, if successfully accomplished, would clearly meet the objectives as stated in the FOA.

Commented [WG44]: Let's chat about this during the meeting.

(b) (5)

ii. Full Applications

Applications will be evaluated against the merit review criteria shown below. All sub-criteria are of equal weight.

Commented [TEM45]: The text provided in this section may not be changed unless the FOA manager has an approved deviation in the FRD.

If the FOA Manager has secured a deviation, when generating language for this section, list merit review criteria, including sub-criteria. Also, list importance, associated weight, or point value. Merit review criterion should be written in a manner that allows reviewers to assign a range of values to each criterion i.e. "extent to which an applicant demonstrates their knowledge of . . . ." or "level of clarity to which and applicant describes . . ."

Criterion 1: Technical Merit, Innovation, and Impact (50%)

Technical Merit and Innovation

- Extent to which the proposed technology or process is innovative;
- Degree to which the current state of the technology and the proposed advancement are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state of the art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations and discussion of prior work in

the literature with analyses that support the viability of the proposed work.

Impact of Technology Advancement

- How the project supports the topic area objectives and target specifications and metrics; and
- The potential impact of the project on advancing the state-of-the-art.

Criterion 2: Project Research and Market Transformation Plan (30%)

Research Approach, Workplan and SOPO

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals.

Commented [MJ46]: If you decide to add a subcriterion re access to datasets, this may be a good spot for it.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and
- Comprehensiveness of market transformation plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, Data Management Plan, and product distribution.

Commented [TEM47]: Delete the reference to the Data Management Plan if your FOA will not require them. Also delete the submission instructions in Section IV and Appendix D.

Commented [MJ48]: Concur.

Criterion 3: Team and Resources (20%)

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- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

iii. Criteria for Replies to Reviewer Comments

EERE has not established separate criteria to evaluate Replies to Reviewer Comments. Instead, Replies to Reviewer Comments are attached to the original applications and evaluated as an extension of the Full Application.

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA, by the standards set forth in EERE's Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011) and the guidance provided in the "Department of Energy Merit Review Guide for Financial Assistance," which is available at: https://energy.gov/management/downloads/merit-review-guide-financial-assistance-and-unsolicited-proposals-current.

C. Other Selection Factors

i. Program Policy Factors

In addition to the above criteria, the Selection Official may consider the following program policy factors in determining which Full Applications to select for award negotiations:

- The degree to which the proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;

Commented [TEM49]: If the amount of cost share is not used as a Program Policy Factor then the section must include this statement: "Cost sharing will not be considered in the evaluation."

Commented [TEM50]: This list should be tailored to give the Selection Official a necessary amount of discretion without being overbroad. Keep this section as short as possible.

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- The degree to which the proposed project, including proposed cost share, optimizes the use of available EERE funding to achieve programmatic objectives;
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers;
- The degree to which the proposed project is likely to lead to increased employment and manufacturing in the United States;
- The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications);
- The degree to which the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty; and
- The degree to which the project would contribute to the body of public datasets available for subsurface R&D

Commented [TEM51]: Add any optional or tailored Program Policy Factors, if additional reviews are planned (e.g., Financial Viability, Commercial Viability, LCOE) add description here. Delete if not applicable.

Commented [MJ52]: Good (b) (5)

D. Evaluation and Selection Process

i. Overview

The evaluation process consists of multiple phases; each includes an initial eligibility review and a thorough technical review. Rigorous technical reviews of eligible submissions are conducted by reviewers that are experts in the subject matter of the FOA. Ultimately, the Selection Official considers the recommendations of the reviewers, along with other considerations such as program policy factors, in determining which applications to select.

ii. Pre-Selection Interviews

As part of the evaluation and selection process, EERE may invite one or more applicants to participate in Pre-Selection Interviews. Pre-Selection Interviews are distinct from and more formal than pre-selection clarifications (See Section V.D.3 of the FOA). The invited applicant(s) will meet with EERE representatives to provide clarification on the contents of the Full Applications and to provide EERE an opportunity to ask questions regarding the proposed project. The information provided by applicants to EERE through Pre-Selection Interviews contributes to EERE's selection decisions.

EERE will arrange to meet with the invited applicants in person at EERE's offices or a mutually agreed upon location. EERE may also arrange site visits

at certain applicants' facilities. In the alternative, EERE may invite certain applicants to participate in a one-on-one conference with EERE via webinar, videoconference, or conference call.

EERE will not reimburse applicants for travel and other expenses relating to the Pre-Selection Interviews, nor will these costs be eligible for reimbursement as pre-award costs.

EERE may obtain additional information through Pre-Selection Interviews that will be used to make a final selection determination. EERE may select applications for funding and make awards without Pre-Selection Interviews. Participation in Pre-Selection Interviews with EERE does not signify that applicants have been selected for award negotiations.

iii. Pre-Selection Clarification

EERE may determine that pre-selection clarifications are necessary from one or more applicants. Pre-selection clarifications are distinct from and less formal than pre-selection interviews. These pre-selection clarifications will solely be for the purposes of clarifying the application, and will be limited to information already provided in the application documentation. The pre-selection clarifications may occur before, during or after the merit review evaluation process. Information provided by an applicant that is not necessary to address the pre-selection clarification question will not be reviewed or considered. Typically, a pre-selection clarification will be carried out through either written responses to EERE's written clarification questions or video or conference calls with EERE representatives.

The information provided by applicants to EERE through pre-selection clarifications is incorporated in their applications and contributes to the merit review evaluation and EERE's selection decisions. If EERE contacts an applicant for pre-selection clarification purposes, it does not signify that the applicant has been selected for negotiation of award or that the applicant is among the top ranked applications.

EERE will not reimburse applicants for expenses relating to the pre-selection clarifications, nor will these costs be eligible for reimbursement as pre-award costs.

iv. Recipient Integrity and Performance Matters

DOE, prior to making a Federal award with a total amount of Federal share greater than the simplified acquisition threshold, is required to review and consider any information about the applicant that is in the designated

integrity and performance system accessible through SAM (currently FAPIIS) (see 41 U.S.C. 2313).

The applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a Federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM.

DOE will consider any written comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under Federal awards when completing the review of risk posed by applicants as described in 2 C.F.R. § 200.205.

v. Selection

The Selection Official may consider the technical merit, the Federal Consensus Board's recommendations, program policy factors, and the amount of funds available in arriving at selections for this FOA.

E. Anticipated Notice of Selection and Award Dates

EERE anticipates notifying applicants selected for negotiation of award by January 2019 and making awards by March 2019.

Commented [TEM53]: The dates in this sentence do not need to be precise; something like "June 20XX" or "Spring 20XX" is appropriate.

VI. Award Administration Information

A. Award Notices

i. Ineligible Submissions

Ineligible Concept Papers and Full Applications will not be further reviewed or considered for award. The Contracting Officer will send a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE Exchange. The notification letter will state the basis upon which the Concept Paper or the Full Application is ineligible and not considered for further review.

ii. Concept Paper Notifications

EERE will notify applicants of its determination to encourage or discourage the submission of a Full Application. EERE will post these notifications to EERE Exchange.

Applicants may submit a Full Application even if they receive a notification discouraging them from doing so. By discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project. Such assessments do not necessarily reflect judgments on the merits of the proposed project. The purpose of the Concept Paper phase is to save applicants the considerable time and expense of preparing a Full Application that is unlikely to be selected for award negotiations.

A notification encouraging the submission of a Full Application does not authorize the applicant to commence performance of the project. Please refer to Section IV.J.2 of the FOA for guidance on pre-award costs.

iii. Full Application Notifications

EERE will notify applicants of its determination via a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE Exchange. The notification letter will inform the applicant whether or not its Full Application was selected for award negotiations. Alternatively, EERE may notify one or more applicants that a final selection determination on particular Full Applications will be made at a later date, subject to the availability of funds or other factors.

iv. Successful Applicants

Receipt of a notification letter selecting a Full Application for award negotiations does not authorize the applicant to commence performance of the project. If an application is selected for award negotiations, it is not a commitment by EERE to issue an award. Applicants do not receive an award until award negotiations are complete and the Contracting Officer executes the funding agreement, accessible by the Prime Recipient in FedConnect.

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. The applicant must be responsive during award negotiations (i.e., provide requested documentation) and meet the negotiation deadlines. If the applicant fails to do so or if award negotiations are otherwise unsuccessful, EERE will cancel the award negotiations and rescind the Selection. EERE reserves the right to terminate award negotiations at any time for any reason.

Please refer to Section IV.J.2 of the FOA for guidance on pre-award costs.

v. Alternate Selection Determinations

In some instances, an applicant may receive a notification that its application was not selected for award and EERE designated the application to be an alternate. As an alternate, EERE may consider the Full Application for Federal funding in the future. A notification letter stating the Full Application is designated as an alternate does not authorize the applicant to commence performance of the project. EERE may ultimately determine to select or not select the Full Application for award negotiations.

vi. Unsuccessful Applicants

EERE shall promptly notify in writing each applicant whose application has not been selected for award or whose application cannot be funded because of the unavailability of appropriated funds.

B. Administrative and National Policy Requirements

i. Registration Requirements

There are several one-time actions before submitting an application in response to this FOA, and it is vital that applicants address these items as soon as possible. Some may take several weeks, and failure to complete them could interfere with an applicant's ability to apply to this FOA, or to meet the negotiation deadlines and receive an award if the application is selected. These requirements are as follows:

1. **EERE Exchange**
   Register and create an account on EERE Exchange at https://eere-Exchange.energy.gov.
   This account will then allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Applicants should also designate backup points of contact so they may be easily contacted if deemed necessary. **This step is required to apply to this FOA.**

   The EERE Exchange registration does not have a delay; however, **the remaining registration requirements below could take several weeks to process and are necessary for a potential applicant to receive an award under this FOA**.

2. **DUNS Number**

Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform.

3. **System for Award Management**
   Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.

4. **FedConnect**
   Register in FedConnect at https://www.fedconnect.net. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf.

5. **Grants.gov**
   Register in Grants.gov (http://www.grants.gov) to receive automatic updates when Amendments to this FOA are posted. However, please note that Concept Papers, and Full Applications will not be accepted through Grants.gov.

6. **Electronic Authorization of Applications and Award Documents**
   Submission of an application and supplemental information under this FOA through electronic systems used by the Department of Energy, including EERE Exchange and FedConnect.net, constitutes the authorized representative's approval and electronic signature.

ii. Award Administrative Requirements

The administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR Part 200 as amended by 2 CFR Part 910.

iii. Foreign National Access to DOE Sites

All applicants that ultimately enter into an award resulting from this FOA will be subject to the following requirement concerning foreign national involvement. Upon DOE's request, Prime Recipients must provide information to facilitate DOE's responsibilities associated with foreign national access to DOE sites, information, technologies, and equipment. A foreign national is defined as any person who was born outside the

jurisdiction of the United States, is a citizen of a foreign government, and has not been naturalized under U.S. law. If the Prime Recipient or Subrecipients, contractors or vendors under the award, anticipate utilizing a foreign national person in the performance of an award, the Prime Recipient is responsible for providing to the Contracting Officer specific information of the foreign national(s) to satisfy compliance with all of the requirements for access approval.

iv. Subaward and Executive Reporting

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency Act of 2006 (FFATA) are contained in 2 CFR Part 170. Prime Recipients must register with the new FFATA Subaward Reporting System database and report the required data on their first tier Subrecipients. Prime Recipients must report the executive compensation for their own executives as part of their registration profile in SAM.

v. National Policy Requirements

The National Policy Assurances that are incorporated as a term and condition of award are located at: http://www.nsf.gov/awards/managing/rtc.jsp.

vi. Environmental Review in Accordance with National Environmental Policy Act (NEPA)

EERE's decision whether and how to distribute federal funds under this FOA is subject to the National Environmental Policy Act (42 USC 4321, *et seq.*). NEPA requires Federal agencies to integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE's NEPA website, at http://nepa.energy.gov/.

While NEPA compliance is a Federal agency responsibility and the ultimate decisions remain with the Federal agency, all recipients selected for an award will be required to assist in the timely and effective completion of the NEPA process in the manner most pertinent to their proposed project. If DOE determines certain records must be prepared to complete the NEPA review process (e.g., biological evaluations or environmental assessments), the costs to prepare the necessary records may be included as part of the project costs.

vii. Applicant Representations and Certifications

1. **Lobbying Restrictions**
   By accepting funds under this award, the Prime Recipient agrees that none of the funds obligated on the award shall be expended, directly or indirectly, to influence Congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. §1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

2. **Corporate Felony Conviction and Federal Tax Liability Representations**
   In submitting an application in response to this FOA, the applicant represents that:

   a. It is **not** a corporation that has been convicted of a felony criminal violation under any Federal law within the preceding 24 months, and
   b. It is **not** a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

   For purposes of these representations the following definitions apply:

   A Corporation includes any entity that has filed articles of incorporation in any of the 50 states, the District of Columbia, or the various territories of the United States [but not foreign corporations]. It includes both for-profit and non-profit organizations.

3. **Nondisclosure and Confidentiality Agreements Representations**
   In submitting an application in response to this FOA the applicant represents that:

   a. It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contactors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

b. It **does not and will not** use any Federal funds to implement or enforce any nondisclosure and/or confidentiality policy, form, or agreement it uses unless it contains the following provisions:

(1) *"These provisions are consistent with and do not supersede, conflict with, or otherwise alter the employee obligations, rights, or liabilities created by existing statute or Executive order relating to (1) classified information, (2) communications to Congress, (3) the reporting to an Inspector General of a violation of any law, rule, or regulation, or mismanagement, a gross waste of funds, an abuse of authority, or a substantial and specific danger to public health or safety, or (4) any other whistleblower protection. The definitions, requirements, obligations, rights, sanctions, and liabilities created by controlling Executive orders and statutory provisions are incorporated into this agreement and are controlling."*

(2) The limitation above shall not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(3) Notwithstanding the provision listed in paragraph (a), a nondisclosure or confidentiality policy form or agreement that is to be executed by a person connected with the conduct of an intelligence or intelligence-related activity, other than an employee or officer of the United States Government, may contain provisions appropriate to the particular activity for which such document is to be used. Such form or agreement shall, at a minimum, require that the person will not disclose any classified information received in the course of such activity unless specifically authorized to do so by the United States Government. Such nondisclosure or confidentiality forms shall also make it clear that they do not bar disclosures to Congress, or to an authorized official of an executive agency or the Department of Justice, that are essential to reporting a substantial violation of law.

viii. Statement of Federal Stewardship

EERE will exercise normal Federal stewardship in overseeing the project activities performed under EERE Awards. Stewardship Activities include, but are not limited to, conducting site visits; reviewing performance and financial reports, providing assistance and/or temporary intervention in usual circumstances to correct deficiencies that develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the project objectives have been accomplished.

ix. Statement of Substantial Involvement

EERE has substantial involvement in work performed under Awards made as a result of this FOA. EERE does not limit its involvement to the administrative requirements of the Award. Instead, EERE has substantial involvement in the direction and redirection of the technical aspects of the project as a whole. Substantial involvement includes, but is not limited to, the following:

1. EERE shares responsibility with the recipient for the management, control, direction, and performance of the Project.

2. EERE may intervene in the conduct or performance of work under this Award for programmatic reasons. Intervention includes the interruption or modification of the conduct or performance of project activities.

3. EERE may redirect or discontinue funding the Project based on the outcome of EERE's evaluation of the Project at that the Go/No Go decision point(s).

4. EERE participates in major project decision-making processes.

Commented [MJ54]: Concur.

x. Subject Invention Utilization Reporting

In order to ensure that Prime Recipients and Subrecipients holding title to subject inventions are taking the appropriate steps to commercialize subject inventions, EERE may require that each Prime Recipient holding title to a subject invention submit annual reports for 10 years from the date the subject invention was disclosed to EERE on the utilization of the subject invention and efforts made by Prime Recipient or their licensees or assignees

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to stimulate such utilization. The reports must include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Prime Recipient, and such other data and information as EERE may specify.

xi. Intellectual Property Provisions

The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at http://www1.eere.energy.gov/financing/resources.html.

xii. Reporting

Commented [TEM55]: Add additional reporting requirements to this section, if applicable. Consult with Legal Counsel and the Contracting Officer before adding any custom text.

Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement. The checklist can be accessed at http://www1.eere.energy.gov/financing/resources.html.

xiii. Go/No-Go Review

Each project selected under this FOA will be subject to a periodic project evaluation referred to as a Go/No-Go Review. Federal funding beyond the Go/No Go decision point (continuation funding), is contingent on (1) the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) meeting the objectives, milestones, deliverables, and decision point criteria of recipient's approved project and obtaining approval from EERE to continue work on the project; and (3) the submittal of required reports in accordance with the Statement of Project Objectives.

As a result of the Go/No Go Review, DOE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

The Go/No-Go decision is distinct from a non-compliance determination. In the event a recipient fails to comply with the requirements of an award, EERE may take appropriate action, including but not limited to, redirecting, suspending or terminating the award.

xiv. Conference Spending

The recipient shall not expend any funds on a conference not directly and programmatically related to the purpose for which the grant or cooperative agreement was awarded that would defray the cost to the United States Government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States Government would otherwise exceed $20,000, thereby circumventing the required notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

xv. UCC Financing Statements

Per 2 CFR 910.360 (Real Property and Equipment) when a piece of equipment is purchased by a for-profit recipient or subrecipient with Federal Funds, and when the Federal share of the financial assistance agreement is more than $1,000,000, the recipient or subrecipient must:

Properly record, and consent to the Department's ability to properly record if the recipient fails to do so, UCC financing statement(s) for all equipment in excess of $5,000 purchased with project funds. These financing statement(s) must be approved in writing by the contracting officer prior to the recording, and they shall provide notice that the Recipient's title to all equipment (not real property) purchased with Federal funds under the financial assistance agreement is conditional pursuant to the terms of this section, and that the Government retains an undivided reversionary interest in the equipment. The UCC financing statement(s) must be filed before the Contracting Officer may reimburse the recipient for the Federal share of the equipment unless otherwise provided for in the relevant financial assistance agreement. The recipient shall further make any amendments to the financing statements or additional recordings, including appropriate continuation statements, as necessary or as the contracting officer may direct.

C. Program Down-Select

In addition to the Go/No Go Reviews required for each project, EERE intends to conduct a competitive project review (down-selection process) upon the completion of an initial (b) (5) investigation. Recipients will present their projects to EERE individually (not to other recipients). Subject matter experts from academia, national laboratories, and industry may be used as reviewers, subject to conflict of interest and non-disclosure considerations. Projects will be evaluated based on the following criterion:

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(b) (5)

Commented [WG57]: In addition to the criterion, I think we should enter something like:
(b) (5)

(Down-Select Managers should insert down-select criteria.)

Down-Selection Process
(b) (5)

We also need to be very specific of what applicants need to submit...

Examples of reports that may be included in the FOA:
(b) (5)

- The degree to which the project meets the research objectives listed in this FOA for Topic 1

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Upon completion of the competitive project review (down-selection process), EERE will select which projects will receive Federal funding beyond [insert decision point]. Due to the availability of funding and program considerations, only a portion of the recipients will be selected to receive funding for project continuation. As a result of this down-select process, certain projects will not receive Federal funding beyond Phase 1 even if the project is meeting the pre-defined metrics.

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VII. Questions/Agency Contacts

Upon the issuance of a FOA, EERE personnel are prohibited from communicating (in writing or otherwise) with applicants regarding the FOA except through the established question and answer process as described below. Specifically, questions regarding the content of this FOA must be submitted to: machinelearninggeo@ee.doe.gov. Questions must be submitted not later than 3 business days prior to the application due date and time.

All questions and answers related to this FOA will be posted on EERE Exchange at: https://eere-exchange.energy.gov. **Please note that you must first select this specific FOA Number in order to view the questions and answers specific to this FOA.** EERE will attempt to respond to a question within 3 business days, unless a similar question and answer has already been posted on the website.

Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov.

VIII. Other Information

A. FOA Modifications

Amendments to this FOA will be posted on the EERE Exchange website and the Grants.gov system. However, you will only receive an email when an amendment or a FOA is posted on these sites if you register for email notifications for this FOA in Grants.gov. EERE recommends that you register as soon after the release of the FOA as possible to ensure you receive timely notice of any amendments or other FOAs.

B. Informational Webinar

EERE will conduct one informational webinar during the FOA process. It will be held after the initial FOA release but before the due date for Concept Papers.

Attendance is not mandatory and will not positively or negatively impact the overall review of any applicant submissions. As the webinar will be open to all applicants who wish to participate, applicants should refrain from asking questions or communicating information that would reveal confidential and/or proprietary information specific to their project. Specific dates for the webinar can be found on the cover page of the FOA.

C. Government Right to Reject or Negotiate

EERE reserves the right, without qualification, to reject any or all applications received in response to this FOA and to select any application, in whole or in part, as a basis for negotiation and/or award.

D. Commitment of Public Funds

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by anyone other than the Contracting Officer, either express or implied, is invalid.

E. Treatment of Application Information

In general, EERE will only use data and other information contained in applications for evaluation purposes, unless such information is generally available to the public or is already the property of the Government.

Applicants should not include trade secrets or commercial or financial information that is privileged or confidential in their application unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the FOA.

The use of protective markings such as "Do Not Publicly Release – Trade Secret" or "Do Not Publicly Release – Confidential Business Information" is encouraged. However, applicants should be aware that the use of protective markings is not dispositive as to whether information will be publicly released pursuant to the Freedom of Information Act, 5 U.S.C. §552, et. seq., as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175. (See Section I of this document, "Notice of Potential Disclosure Under the Freedom of Information Act (FOIA)" for additional information regarding the public release of information under the Freedom of Information Act.

Applicants are encouraged to employ protective markings in the following manner:

The cover sheet of the application must be marked as follows and identify the specific pages containing trade secrets or commercial or financial information that is privileged or confidential:

> Notice of Restriction on Disclosure and Use of Data:
> Pages [list applicable pages] of this document may contain trade secrets or commercial or financial information that is privileged or confidential, and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source. [End of Notice]

The header and footer of every page that contains trade secrets or commercial or financial information that is privileged must be marked as follows: "May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure."

In addition, each line or paragraph containing trade secrets or commercial or financial information that is privileged or confidential must be enclosed in brackets.

F. Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation, the Go/No-Go Review and Peer Review, the Government may seek the advice of qualified non Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

G. Notice Regarding Eligible/Ineligible Activities

Eligible activities under this FOA include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

H. Notice of Right to Conduct a Review of Financial Capability

EERE reserves the right to conduct an independent third party review of financial capability for applicants that are selected for negotiation of award (including personal credit information of principal(s) of a small business if there is insufficient information to determine financial capability of the organization).

I. Notice of Potential Disclosure Under Freedom of Information Act (FOIA)

Under the Freedom of Information Act, (FOIA), 5 U.S.C. §552, et. seq., as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175, any information received from the Applicant is considered to be an agency record, and as such, subject to public release under FOIA. The purpose of the FOIA is to afford the public the right to request and receive agency records unless those agency records are protected from disclosure under one or more of the nine FOIA exemptions. Decisions to disclose or withhold information received from the Applicant are based upon the applicability of one or more of the nine FOIA exemptions, not on the existence or nonexistence of protective markings or designations. Only the agency's designated FOIA Officer may determine if information received from the Applicant may be withheld pursuant to one of the nine FOIA exemptions. All FOIA requests received by DOE are processed in accordance with 10 C.F.R. Part 1004.

J. Requirement for Full and Complete Disclosure

Applicants are required to make a full and complete disclosure of all information requested. Any failure to make a full and complete disclosure of the requested information may result in:

- The termination of award negotiations;
- The modification, suspension, and/or termination of a funding agreement;
- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of Federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

K. Retention of Submissions

EERE expects to retain copies of all Concept Papers, Full Applications, Replies to Reviewer Comments, and other submissions. No submissions will be returned. By applying to EERE for funding, applicants consent to EERE's retention of their submissions.

L. Title to Subject Inventions

Ownership of subject inventions is governed pursuant to the authorities listed below.

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions.
- All other parties: The Federal Non-Nuclear Energy Act of 1974, 42. U.S.C. 5908, provides that the Government obtains title to new inventions unless a waiver is granted (see below).
- Class Patent Waiver:

DOE has issued a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan are sufficient.

- Advance and Identified Waivers: Applicants may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to EERE within the timeframes set forth in the award's intellectual property terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784.

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M. Government Rights in Subject Inventions

Where Prime Recipients and Subrecipients retain title to subject inventions, the U.S. Government retains certain rights.

i. Government Use License

The U.S. Government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world. This license extends to contractors doing work on behalf of the Government.

ii. March-In Rights

The U.S. Government retains march-in rights with respect to all subject inventions. Through "march-in rights," the Government may require a Prime Recipient or Subrecipient who has elected to retain title to a subject invention (or their assignees or exclusive licensees), to grant a license for use of the invention to a third party. In addition, the Government may grant licenses for use of the subject invention when a Prime Recipient, Subrecipient, or their assignees and exclusive licensees refuse to do so.

DOE may exercise its march-in rights only if it determines that such action is necessary under any of the four following conditions:

- The owner or licensee has not taken or is not expected to take effective steps to achieve practical application of the invention within a reasonable time;
- The owner or licensee has not taken action to alleviate health or safety needs in a reasonably satisfied manner;
- The owner has not met public use requirements specified by Federal statutes in a reasonably satisfied manner; or
- The U.S. Manufacturing requirement has not been met.

Any determination that march-in rights are warranted must follow a fact-finding process in which the recipient has certain rights to present evidence and witnesses, confront witnesses and appear with counsel and appeal any adverse decision. To date, DOE has never exercised its march-in rights to any subject inventions.

N. Rights in Technical Data

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Data rights differ based on whether data is first produced under an award or instead was developed at private expense outside the award.

"Limited Rights Data": The U.S. Government will not normally require delivery of confidential or trade secret-type technical data developed solely at private expense prior to issuance of an award, except as necessary to monitor technical progress and evaluate the potential of proposed technologies to reach specific technical and cost metrics.

Government rights in Technical Data Produced Under Awards: The U.S. Government normally retains unlimited rights in technical data produced under

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Government financial assistance awards, including the right to distribute to the public. However, pursuant to special statutory authority, certain categories of data generated under EERE awards may be protected from public disclosure for up to five years after the data is generated ("Protected Data"). For awards permitting Protected Data, the protected data must be marked as set forth in the awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

O. Copyright

The Prime Recipient and Subrecipients may assert copyright in copyrightable works, such as software, first produced under the award without EERE approval. When copyright is asserted, the Government retains a paid-up nonexclusive, irrevocable worldwide license to reproduce, prepare derivative works, distribute copies to the public, and to perform publicly and display publicly the copyrighted work. This license extends to contractors and others doing work on behalf of the Government.

Commented [TEM65]: If Open-Source Software is not an objective of this FOA, you should remove this sentence and remove Appendix E.

P. Personally Identifiable Information (PII)

All information provided by the Applicant must to the greatest extent possible exclude Personally Identifiable Information (PII). The term "personally identifiable information" refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, etc. alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name, etc. (See OMB Memordum M-07-16 dated May 22, 2007, found at: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2007/m07-16.pdf

By way of example, Applicants must screen resumes to ensure that they do not contain PII such as personal addresses, phone/cell numbers, personal emails and/or SSNs. In short, if the PII is not essential to the application, it should not be in the application.

Q. Annual Independent Audits

If a for-profit entity is a Prime Recipient and has expended $750,000 or more of DOE awards during the entity's fiscal year, an annual Compliance Audit performed

by an independent auditor is required. For additional information, please refer to 2 C.F.R. § 910.501 and Subpart F.

If an educational institution, non-profit organization, or state/local government is a Prime Recipient or Subrecipient and has expended $750,000 or more of Federal awards during the non-Federal entity's fiscal year, then a Single or Program-Specific Audit is required. For additional information, please refer to 2 C.F.R. § 200.501 and Subpart F.

Applicants and sub-recipients (if applicable) should propose sufficient costs in the project budget to cover the costs associated with the audit. EERE will share in the cost of the audit at its applicable cost share ratio.

Appendix A – Cost Share Information

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Cost Sharing or Cost Matching

The terms "cost sharing" and "cost matching" are often used synonymously. Even the DOE Financial Assistance Regulations, 2 CFR 200.306, use both of the terms in the titles specific to regulations applicable to cost sharing. EERE almost always uses the term "cost sharing," as it conveys the concept that non-federal share is calculated as a percentage of the Total Project Cost. An exception is the State Energy Program Regulation, 10 CFR 420.12, State Matching Contribution. Here "cost matching" for the non-federal share is calculated as a percentage of the Federal funds only, rather than the Total Project Cost.

How Cost Sharing Is Calculated

As stated above, cost sharing is calculated as a percentage of the Total Project Cost. FFRDC costs must be included in Total Project Costs. Following is an example of how to calculate cost sharing amounts for a project with $1,000,000 in federal funds with a minimum 20% non-federal cost sharing requirement:

- Formula: Federal share ($) divided by Federal share (%) = Total Project Cost
  Example: $1,000,000 divided by 80% = $1,250,000
- Formula: Total Project Cost ($) minus Federal share ($) = Non-federal share ($)
  Example: $1,250,000 minus $1,000,000 = $250,000
- Formula: Non-federal share ($) divided by Total Project Cost ($) = Non-federal share (%)
  Example: $250,000 divided by $1,250,000 = 20%

What Qualifies For Cost Sharing

While it is not possible to explain what specifically qualifies for cost sharing in one or even a couple of sentences, in general, if a cost is allowable under the cost principles applicable to the organization incurring the cost and is eligible for reimbursement under an EERE grant or cooperative agreement, then it is allowable as cost share. Conversely, if the cost is not allowable under the cost principles and not eligible for reimbursement, then it is not allowable as cost share. In addition, costs may not be counted as cost share if they are paid by the Federal Government under another award unless authorized by Federal statute to be used for cost sharing.

The rules associated with what is allowable as cost share are specific to the type of organization that is receiving funds under the grant or cooperative agreement, though are generally the same for all types of entities. The specific rules applicable to:

- FAR Part 31 for For-Profit entities, (48 CFR Part 31); and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

In addition to the regulations referenced above, other factors may also come into play such as timing of donations and length of the project period. For example, the value of ten years of donated maintenance on a project that has a project period of five years would not be fully allowable as cost share. Only the value for the five years of donated maintenance that corresponds to the project period is allowable and may be counted as cost share.

Additionally, EERE generally does not allow pre-award costs for either cost share or reimbursement when these costs precede the signing of the appropriation bill that funds the award. In the case of a competitive award, EERE generally does not allow pre-award costs prior to the signing of the Selection Statement by the EERE Selection Official.

General Cost Sharing Rules on a DOE award

1. Cash Cost Share - encompasses all contributions to the project made by the recipient or subrecipeint(s), for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment, etc. for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project.

2. In Kind Cost Share - encompasses all contributions to the project made by the recipient or subrecipient(s) that do not involve a payment or reimbursement and represent donated items or services. In Kind cost share items include volunteer personnel hours, donated existing equipment, donated existing supplies, etc. The cash value and calculations thereof for all In Kind cost share items must be justified and explained in the Cost Share section of the project Budget Justification (EERE 335). All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out the In Kind cost share section of the Budget Justification (EERE 335).

3. Funds from other Federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC sub-recipients. Non-Federal sources include any source not originally derived from Federal funds. Cost sharing commitment letters from subrecipients must be provided with the original application.

4. Fee or profit, including foregone fee or profit, are not allowable as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

DOE Financial Assistance Rules 2 CFR Part 200 as amended by 2 CFR Part 910

As stated above, the rules associated with what is allowable cost share are generally the same for all types of organizations. Following are the rules found to be common, but again, the specifics are contained in the regulations and cost principles specific to the type of entity:

(A) Acceptable contributions. All contributions, including cash contributions and third party in-kind contributions, must be accepted as part of the Prime Recipient's cost sharing if such contributions meet all of the following criteria:

(1) They are verifiable from the recipient's records.

(2) They are not included as contributions for any other federally-assisted project or program.

(3) They are necessary and reasonable for the proper and efficient accomplishment of project or program objectives.

(4) They are allowable under the cost principles applicable to the type of entity incurring the cost as follows:

a. For-profit organizations. Allowability of costs incurred by for-profit organizations and those nonprofit organizations listed in Attachment C to OMB Circular A–122 is determined in accordance with the for-profit cost principles in 48 CFR Part 31 in the Federal Acquisition Regulation, except that patent prosecution costs are not allowable unless specifically authorized in the award document. (v) Commercial Organizations. FAR Subpart 31.2—Contracts with Commercial Organizations

b. Other types of organizations. For all other non-federal entities, allowability of costs is determined in accordance with 2 CFR Part 200 Subpart E.

(5) They are not paid by the Federal Government under another award unless authorized by Federal statute to be used for cost sharing or matching.

(6) They are provided for in the approved budget.

(B) Valuing and documenting contributions

(1) Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that amounts chargeable to the project are determined on the basis of costs incurred. For real property or equipment used on the project, the cost principles authorize depreciation or use charges. The full value of the item may be applied when the item will be consumed in the performance of the award or fully depreciated by the end of the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

a. The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or
b. The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.

(2) Valuing services of others' employees. If an employer other than the recipient furnishes the services of an employee, those services are valued at the employee's regular rate of pay, provided these services are for the same skill level for which the employee is normally paid.

(3) Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as cost sharing or matching if the service is an integral and necessary part of an approved project or program. Rates for volunteer services must be consistent with those paid for similar work in the recipient's organization. In those markets in which the required skills are not found in the recipient organization, rates must be consistent with those paid for similar work in the labor market in which the recipient competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.

(4) Valuing property donated by third parties.

a. Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the cost sharing or matching share must be reasonable and must not exceed the fair market value of the property at the time of the donation.

b. Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:

   i. The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of comparable space and facilities in a privately-owned building in the same locality.
   ii. The value of loaned equipment must not exceed its fair rental value.

(5) Documentation. The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:

a. Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.

b. The basis for determining the valuation for personal services and property must be documented.

Appendix B – Sample Cost Share Calculation for Blended Cost Share Percentage

The following example shows the math for calculating required cost share for a project with $2,000,000 in Federal funds with four tasks requiring different Non-federal cost share percentages:

Task	Proposed Federal Share	Federal Share %	Recipient Share %
Task 1 (R&D)	$1,000,000	80%	20%
Task 2 (R&D)	$500,000	80%	20%
Task 3 (Demonstration)	$400,000	50%	50%
Task 4 (Outreach)	$100,000	100%	0%

Federal share ($) divided by Federal share (%) = Task Cost

Each task must be calculated individually as follows:

Task 1
$1,000,000 divided by 80% = $1,250,000 (Task 1 Cost)
Task 1 Cost minus federal share = Non-federal share
$1,250,000 - $1,000,000 = $250,000 (Non-federal share)

Task 2
$500,000 divided 80% = $625,000 (Task 2 Cost)
Task 2 Cost minus federal share = Non-federal share
$625,000 - $500,000 = $125,000 (Non-federal share)

Task 3
$400,000 / 50% = $800,000 (Task 3 Cost)
Task 3 Cost minus federal share = Non-federal share
$800,000 - $400,000 = $400,000 (Non-federal share)

Task 4
Federal share = $100,000
Non-federal cost share is not mandated for outreach = $0 (Non-federal share)

The calculation may then be completed as follows:

Tasks	$ Federal Share	% Federal Share	$ Non-Federal Share	% Non-Federal Share	Total Project Cost
Task 1	$1,000,000	80%	$250,000	20%	$1,250,000
Task 2	$500,000	80%	$125,000	20%	$625,000
Task 3	$400,000	50%	$400,000	50%	$800,000
Task 4	$100,000	100%	$0	0%	$100,000
Totals	$2,000,000		$775,000		$2,775,000

Blended Cost Share %
Non-federal share ($775,000) divided by Total Project Cost ($2,775,000) = 27.9% (Non-federal)
Federal share ($2,000,000) divided by Total Project Cost ($2,775,000) = 72.1% (Federal)

Appendix C – Waiver Requests: Foreign Entity Participation as the Prime Recipient and Performance of Work in the United States

1. Waiver for Foreign Entity Participation as the Prime Recipient

As set forth in Section III.A.3, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

Overall, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the Prime Recipient. A request to waive the *Foreign Entity Participation as the Prime Recipient* requirement must include the following:

- Entity name;
- The rationale for proposing a foreign entity to serve as the Prime Recipient;
- Country of incorporation;
- A description of the project's anticipated contributions to the US economy;
    - How the project will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
    - How the project will promote domestic American manufacturing of products and/or services;
- A description of how the foreign entity's participation as the Prime Recipient is essential to the project;
- A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP;
- Countries where the work will be performed (Note: if any work is proposed to be conducted outside the U.S., the applicant must also complete a separate request for waiver of the Performance of Work in the United States requirement).

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE's decision concerning a waiver request.

2. Waiver for Performance of Work in the United States

As set forth in Section IV.J.3, all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a

waiver is not required for foreign purchases of these items. However, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

Overall, a waiver request must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to perform work outside of the United States. A request to waive the *Performance of Work in the United States* requirement must include the following:

- The rationale for performing the work outside the U.S. ("foreign work");
- A description of the work proposed to be performed outside the U.S.;
- An explanation as to how the foreign work is essential to the project;
- A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the US economy;
    - The associated benefits to be realized and the contribution to the project from the foreign work;
    - How the foreign work will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
    - How the foreign work will promote domestic American manufacturing of products and/or services;
- A description of the likelihood of Intellectual Property (IP) being created from the foreign work and the treatment of any such IP;
- The total estimated cost (DOE and Recipient cost share) of the proposed foreign work;
- The countries in which the foreign work is proposed to be performed; and
- The name of the entity that would perform the foreign work.

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE's decision concerning a waiver request.

Appendix D - Data Management Plan

Commented [TEM67]: This Appendix must be included in all R&D FOAs. It may also be used in certain non R&D FOAs if a Technology Office wishes to obtain DMPs from applicants or selectees. If you are unsure whether to include this Appendix, please consult your IP Counsel.

A data management plan ("DMP") explains how data generated in the course of the work performed under an EERE award will be shared and preserved or, when justified, explains why data sharing or preservation is not possible or scientifically appropriate.

DMP Requirements

In order for a DMP to be considered acceptable, the DMP must address the following:

At a minimum, the DMP must describe how data sharing and preservation will enable validation of the results from the proposed work, or how results could be validated if data are not shared or preserved.

The DMP must provide a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publication. This includes data that are displayed in charts, figures, images, etc. In addition, the underlying digital research data used to generate the displayed data should be made as accessible as possible in accordance with the principles stated above. This requirement could be met by including the data as supplementary information to the published article, or through other means. The published article should indicate how these data can be accessed.

The DMP should consult and reference available information about data management resources to be used in the course of the proposed work. In particular, a DMP that explicitly or implicitly commits data management resources at a facility beyond what is conventionally made available to approved users should be accompanied by written approval from that facility. In determining the resources available for data management at DOE User Facilities, researchers should consult the published description of data management resources and practices at that facility and reference it in the DMP. Information about other DOE facilities can be found in the additional guidance from the sponsoring program.

The DMP must protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; avoid significant negative impact on innovation, and U.S. competitiveness; and otherwise be consistent with all laws (i.e., export control laws), and DOE regulations, orders, and policies.

Data Determination for a DMP

The Principal Investigator should determine which data should be the subject of the DMP and, in the DMP, propose which data should be shared and/or preserved in accordance with the DMP Requirements noted above.

For data that will be generated through the course of the proposed work, the Principal Investigator should indicate what types of data should be protected from immediate public disclosure by DOE (referred to as "protected data") and what types of data that DOE should be able to release immediately. Similarly, for data developed outside of the proposed work at private expense that will be used in the course of the proposed work, the Principal Investigator should indicate whether that type of data will be subject to public release or kept confidential (referred to as "limited rights data"). Any use of limited rights data or labeling of data as "protected data" must be consistent with the DMP Requirements noted above.

Suggested Elements for a DMP

The following list of elements for a DMP provides suggestions regarding the data management planning process and the structure of the DMP:

Data Types and Sources: A brief, high-level description of the data to be generated or used through the course of the proposed work and which of these are considered digital research data necessary to validate the research findings or results.

Content and Format: A statement of plans for data and metadata content and format including, where applicable, a description of documentation plans, annotation of relevant software, and the rationale for the selection of appropriate standards. Existing, accepted community standards should be used where possible. Where community standards are missing or inadequate, the DMP could propose alternate strategies for facilitating sharing, and should advise the sponsoring program of any need to develop or generalize standards.

Sharing and Preservation: A description of the plans for data sharing and preservation. This should include, when appropriate: the anticipated means for sharing and the rationale for any restrictions on who may access the data and under what conditions; a timeline for sharing and preservation that addresses both the minimum length of time the data will be available and any anticipated delay to data access after research findings are published; any special requirements for data sharing, for example, proprietary software needed to access or interpret data, applicable policies, provisions, and licenses for re-use and re-distribution, and for the production of derivatives, including guidance for how data and data products should be cited; any resources and capabilities (equipment, connections,

systems, software, expertise, etc.) requested in the research proposal that are needed to meet the stated goals for sharing and preservation (this could reference the relevant section of the associated research proposal and budget request); and whether/where the data will be preserved after direct project funding ends and any plans for the transfer of responsibilities for sharing and preservation.

Protection: A statement of plans, where appropriate and necessary, to protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; and avoid significant negative impact on innovation, and U.S. competitiveness.

Rationale: A discussion of the rationale or justification for the proposed data management plan including, for example, the potential impact of the data within the immediate field and in other fields, and any broader societal impact.

Additional Guidance

In determining which data should be shared and preserved, researchers must consider the data needed to validate research findings as described in the Requirements, and are encouraged to consider the potential benefits of their data to their own fields of research, fields other than their own, and society at large.

DMPs should reflect relevant standards and community best practices and make use of community accepted repositories whenever practicable.

Costs associated with the scope of work and resources articulated in a DMP may be included in the proposed research budget as permitted by the applicable cost principles.

To improve the discoverability of and attribution for datasets created and used in the course of research, EERE encourages the citation of publicly available datasets within the reference section of publications, and the identification of datasets with persistent identifiers such as Digital Object Identifiers (DOIs). In most cases, EERE can provide DOIs free of charge for data resulting from DOE-funded research through its Office of Scientific and Technical Information (OSTI) DataID Service.

EERE's Digital Data Management principles can be found at: EERE Digital Data Management | Department of Energy

Definitions

Data Preservation: Data preservation means providing for the usability of data beyond the lifetime of the research activity that generated them.

Data Sharing: Data sharing means making data available to people other than those who have generated them. Examples of data sharing range from bilateral communications with colleagues, to providing free, unrestricted access to anyone through, for example, a web-based platform.

Digital Research Data: The term digital data encompasses a wide variety of information stored in digital form including: experimental, observational, and simulation data; codes, software and algorithms; text; numeric information; images; video; audio; and associated metadata. It also encompasses information in a variety of different forms including raw, processed, and analyzed data, published and archived data.

Research Data: The recorded factual material commonly accepted in the scientific community as necessary to validate research findings, but not any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, or communications with colleagues. This 'recorded' material excludes physical objects (e.g., laboratory samples). Research data also do not include:

> (A) Trade secrets, commercial information, materials necessary to be held confidential by a researcher until they are published, or similar information which is protected under law; and
>
> (B) Personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy, such as information that could be used to identify a particular person in a research study."

Validate: In the context of DMPs, validate means to support, corroborate, verify, or otherwise determine the legitimacy of the research findings. Validation of research findings could be accomplished by reproducing the original experiment or analyses; comparing and contrasting the results against those of a new experiment or analyses; or by some other means.

Financial Assistance
Funding Opportunity Announcement

Department of Energy (DOE)
Office of Energy Efficiency and Renewable Energy (EERE)

Advanced Wind R&D to Reduce Costs and Environmental Impacts

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001924
FOA Type: Initial
CFDA Number: 81.087

FOA Issue Date:	July 24th, 2018
Submission Deadline for Concept Papers:	August 21st, 2018 5:00pm ET
Submission Deadline for Full Applications:	Oct 2nd, 2018 5:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	Nov 6th, 2018 5:00pm ET
Expected Date for EERE Selection Notifications:	Winter 2018
Expected Timeframe for Award Negotiations	Early 2019

- Applicants must submit a Concept Paper by 5:00pm ET the due date listed above to be eligible to submit a Full Application.
- To apply to this FOA, applicants must register with and submit application materials through EERE Exchange at https://eere-Exchange.energy.gov, EERE's online application portal.
- Applicants must designate primary and backup points-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. If an application is selected for award negotiations, it is not a commitment to issue an award. It is imperative that the applicant/selectee be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancelation of further award negotiations and rescission of the Selection.

Questions about this FOA? Email WindFarmFOA@ee.doe.gov
Problems with EERE Exchange? Email EERE- EERE-ExchangeSupport@hq.doe.gov Include FOA name and number in subject line.

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I. Funding Opportunity Description

A. Description/Background

The Wind Energy Technologies Office (WETO) invests in early-stage applied energy science research, development, and validation activities for United States land-based, offshore and distributed wind power generation, manufacturing, and market barriers to lower wind energy costs, increase capacity, accelerate reliable and safe energy production, and address environmental and human use considerations.

Topic Area 1
As WETO works to reduce the cost of wind energy across the nation and to catalyze the advancement of larger turbines able to capture lower wind speed classes, there are operational and technological challenges that will need to be overcome. Curtailment regimes, applied at many sites to reduce impacts on bat species, can have large impacts on power production and project revenue. Additionally, while wind speed-based curtailment regimes result in significant reductions in take, there is room for improvement in take reductions.

Wind technology advancements in rotor size and hub height will enable the development of wind energy facilities in new, lower wind speed markets. While curtailment-derived power production losses impact project economics, wind-speed based curtailment regimes will have a proportionally larger effect on projects in lower average wind speed regions. As a result, significant refinement of curtailment may help make wind cost competitive at such sites, while minimizing revenue loss at all sites where curtailment is required.

To date, there have been promising advancements in making curtailment strategies more informed or "smarter", leading to curtailment only during periods of greatest risk. Such refined curtailment regimes can lead to both reduced power loss and reduced environmental impacts, when compared to curtailment regimes based solely on blanket cut-in speed adjustments. Through this solicitation, WETO seeks to fund research to further the advancement of such smart curtailment strategies with an aim to both minimize power loss and wind farm environmental impacts.

Topic Area 2
The development of bat deterrent technologies may help further minimize or eliminate the need for curtailment and reduce the environmental impacts of wind turbines to bats. TheWETO) previously funded a suite of bat deterrent technologies aimed at reducing bat impacts at wind farms. This research led to advancements in prototype technologies and provided data on existing technology research and development needs. Despite these

advancements, across the suite of potential solutions, some technologies remain early-stage. For other technology types there is the need for an additional design spiral to develop technical solutions to specific performance gaps.

Topic Area 3
Offshore wind faces unique environmental monitoring and mitigation challenges when compared with land-based wind farms. As part of the environmental review and monitoring process, offshore wind developers are asked to perform a number of studies looking at the presence and abundance of species on their prospective sites. Further, once projects are in operation, developers may be required to perform extensive monitoring of the impacts of their projects on these species. However, both pre- and post-construction monitoring presents a unique set of challenges not faced by onshore projects. For example, the lack of fixed platforms, increased difficulties associated with survivability offshore, access for maintenance or data downloading, and availability of electric power all make required studies more difficult and more expensive.

Further, there is a need for automation of monitoring techniques. For example, vessel and aerial monitoring efforts are greatly limited by weather conditions, sea state, and visibility, potentially leading to data biases; and importantly, standard searches to monitor and quantify collision rates onshore are not feasible in the offshore environment.

A central issue in permitting offshore wind projects is the impact of siting and construction activity noise on a range of species, including cetaceans and, importantly, Northern Atlantic Right Whales. There is a need both for an expanded suite of tools to minimize noise propagation and for monitoring tools to detect marine mammals that may be in the vicinity of or approaching noise-generating siting and construction activities.

DOE therefore seeks applications for development and validation of pre- and post-construction monitoring and mitigation solutions in the offshore wind environment. This FOA aims to develop technical solutions in order to reduce permitting risks, reduce environmental impacts, lower costs, and facilitate offshore wind development.

B. Topic Areas/Technical Areas of Interest

***Topic Area 1**: Advancing Smart Curtailment Strategies*
This Topic Area supports the development, optimization, and validation of wind farm operational regimes and advanced turbine control algorithms designed to minimize the energy loss due to curtailment regimes currently required at many sites to minimize

mortality of listed bat species at wind farms, while preserving or further improving environmental impact reductions associated with the current practice of wind speed-based cut-in speed adjustments.

Applications should:

- Clearly describe the performance goals for their proposed informed curtailment regime, including end-of-project power loss and environmental performance targets.

- Detail the methodological approach they will take to reach those targets.

Applicants to this FOA should design methodologies capable of discerning changes in power production and environmental impacts for key species of concern. Applicants are also encouraged to propose methodological approaches that examine consistency or differences in power production and species-specific performance between sites, climates, and years. Applicants are encouraged to propose research tasks that compare power loss and environmental impacts between their experimental smart curtailment treatment, a wind-speed based curtailment regime (e.g., raising cut-in speeds to 5.0 m/s during periods of high bat activity), and a control treatment.

Applications should include a rigorous justification of proposed methodological approach, including prior data or trials that suggest that the approach will lead to the outcomes outlined above. During award negotiation DOE will review the methodology, and will ask awardees to develop a final agreed-upon methodology before beginning research. DOE may also subject research plans to independent peer review prior to award or inception of research activities.

Applicants must also already have, or show the ability to obtain any necessary take permits or authorizations in a timely manner. Proposals should discuss the types of permits/authorizations required to carry out the proposed project scope, and include plans to obtain such permits/authorizations if not already in hand. Where appropriate, applicants must confer with the U.S. Fish and Wildlife Service, and other regulatory agencies at the state and local level to determine the necessary permits, authorizations, or other requirements for the proposed research. Note that issuance of a cooperative agreement from this Program does not authorize the take of any listed bat species, does not commit the government to enter into any settlement agreement, and does not in any way affect the enforcement of the Endangered Species Act (ESA or other wildlife laws.

Specific deliverables will include, but are not limited to:

1) Quarterly reports and presentations to DOE outlining progress made on all awarded tasks,
2) Annual technical reports for multi-year awards,
3) A peer-reviewed, publicly available, final report that includes a detailed technical summary of all tasks, results of performance testing, and cost analysis,
4) Participation in WETO Program Peer Review activities occurring during or within 1-2 years following the completion of the project, and
5) Submission of a manuscript on project methodology and results for publication in a peer-reviewed journal.

Topic Area 2: *Advanced Component Research and Development*

This Topic Area supports the development of novel advanced components/instrumentation, such as ultrasonic acoustic deterrents, to deter bats from wind turbines or wind farms that could be used in lieu of curtailment, to reduce bat take. This Topic Area will support technology research and development activities to:

1) Develop novel approaches and configurations.
2) Increase range/area of coverage of systems, with an aim to not only cover as much of the rotor swept zone as possible for existing turbines, but also in an effort to ensure the greatest coverage possible for the larger rotors of future turbines.
3) Redesign and test deterrent stimuli to target existing gaps, specifically including known gaps in species-specific effectiveness.
4) Work to address fundamental design questions including integration with blades, power system integration, and weatherization.
5) Establish the efficacy of these improvements.

In order to receive funding under this solicitation, applications will need to credibly demonstrate that the proposed technology has the potential to be an effective and affordable long-term solution for reducing bat take at wind farms and should aim to be effective at reducing take for both high and low frequency calling species.

Applications should:

- Clearly describe the goals of their project including end-of-project technical and cost targets.

- Detail the methodological approach they will take to reach those targets. Projects are encouraged to take a methodological and step-wise approach to system design or re-

design to ensure effectiveness for species of concern, including development of deterrent mechanism based on species' biology and behavior and incremental testing of effectiveness of this mechanism relative to species of concern.

Additional information that should be provided:

- Applications should clearly define the current technical capabilities of your proposed technology. For ultrasonic deterrent devices, you should provide the current device frequency-dependent sound output, at minimum providing estimates of current noise measurements (dB at 1 m and 40 m at 20 kH and 50kH).

- Applications for deterrent technologies should include evidence of effectiveness to date (including citations where possible) and biological justification of why the specific deterrent stimulus was selected and likely to induce the desired response over time. Applications should include information to support the potential for the technology to be an effective solution across a range of species that call in both high and low frequencies.

- Consideration of potential for habituation and how those risks have or will be minimized should also be discussed.

- Applications should describe proposed system configuration, including intended mounting location for the device (e.g., on a turbine nacelle or blades) and associated considerations, such as power source, accessibility, and discussion on potential impacts to turbine warrantees. For proposed blade mounted systems, challenges associated with blade mounting, ranging from but not limited to impact on aerodynamics, blade integrity, and lightning strike vulnerability, and proposed solutions to those challenges should be addressed. Additionally, to the extent possible please provide any evidence or indication of a turbine manufacturer's willingness to integrate such blade-mounted solutions.

- For field testing under these awards, applications should provide a detailed description of plans for field testing, including proposed methodological approach, and the proposed field study site (i.e., characterization of wind speeds, terrain, and bat usage). It should be noted, however, that during award negotiation EERE will review the methodology, and will ask awardees to develop a final agreed-upon methodology before beginning research. DOE may also subject research plans to independent peer review prior to award or inception of research activities. Note: for proposed testing of prototypes at wind farms, 50% cost share is required for these activities. Additionally, EERE strongly encourages teams to include biologists or consultants capable of conducting the biological field studies associated with the impact minimization

technology. Those biologist should be charged with establishing methodologies and conducting effectiveness trials in an independent fashion to ensure neutrality of results. These biologists or consultants should have appropriate biological expertise, including well-demonstrated experience with designing and conducting successful relevant environmental monitoring or research at wind farms, expertise regarding the species of interest, and expertise in relevant statistical methodology for wind farm environmental impact study design and data analysis.

- Data on or plans to ensure component and system survivability/ruggedness in the field should be detailed.

Awardees under Topic Area 2 will be asked to produce an end-of-project analysis of technical performance and of the full costs of the technology. Information regarding system and/or component technical specifications may be protected from public disclosure if properly marked and delivered to DOE (see Section VIII. M. for further details); however, performance results will be made publicly available.

Teams must also already have, or show the ability to obtain, any necessary permits or authorizations in a timely manner. Applications should discuss the types of permits/authorizations anticipated to be required to carry out project scope and plans to obtain such permits/authorizations. Teams must confer with the U.S. Fish and Wildlife Service to determine the appropriate permits, authorizations, or other requirements necessary for the proposed research and wind energy facilities. Note that issuance of a cooperative agreement from this program does not authorize the take of bats, does not commit the government to enter into any settlement agreement, and does not in any way affect the enforcement of the ESA or other wildlife laws.

Specific deliverables will include, but are not limited to:

1) Quarterly reports and presentations to DOE outlining progress made on all awarded tasks,
2) Annual technical reports for multi-year awards,
3) A peer-reviewed, publicly available, final report that includes a detailed technical summary of all tasks, results of performance testing, and cost analysis,
4) Participation in WETO Program Peer Review activities occurring during or within 1-2 years following the completion of the project, and
5) Submission of a manuscript on project methodology and results for publication in a peer-reviewed journal for any effectiveness testing.

Topic Area 3: *Development and Validation of Offshore Wind Monitoring and Mitigation Technologies*

Topic Area 3 will support the development and validation of monitoring and mitigation technologies for use in offshore environments in an effort to address offshore wind challenges unique to U.S. waters. Applications should be targeted to fill gaps in existing technology capabilities in order to address US offshore wind permitting and environmental compliance needs. These tools should be designed to replace the need for on-site human observers, increase performance compared to current practices, and reduce risk associated with data collection in the offshore environment.

Awards issued under this topic area will support the development and validation of pre- and post-construction monitoring and mitigation solutions in the offshore wind environment. Of particular interest are applications that seek to address:

- The development and validation of automated blade impact monitoring systems. Such systems should allow for remote monitoring, identification, and classification of organisms with offshore wind turbine blades.

- The development of solutions to noise impacts on marine mammals, including systems designed to either mitigate noise or monitor exclusion zones around construction activities, with a particular emphasis on systems for detection and possibly tracking of North Atlantic Right whales in or approaching exclusion zones.

Additionally, DOE has interest in supporting the development of monitoring technologies to fill current high priority gaps.

- The development of hardware and software tools to overcome the challenges associated with monitoring and analyzing environmental impacts in the offshore environment, including the development and validation of technologies for measuring pre-and post-construction species' presence, abundance, and behavior that can operate on moving platforms, such as buoys.
- The development and validation of other economical and biologically effective pre- and post-construction impact mitigation solutions.

Applications should:

1. Demonstrate that proposed studies will provide results that will substantially reduce regulatory and environmental risks to future projects facing similar issues by substantially reducing the costs and/or risks associated with performing required environmental monitoring

2. Clearly describe the goals of their project including end-of-project technical and cost targets.

3. Detail the methodological approach they will take to reach those targets.

Additional information that should be provided:

- Applications should clearly define the current capabilities of their technologies. Where relevant, current species detection, classification, and tracking capabilities should be detailed.

- Applications should describe proposed system configuration, including intended mounting location for the device or proposed intended platform and associated considerations, such as power source, accessibility, and discussion on potential impacts to turbine warrantees. For proposed blade mounted systems, challenges associated with blade mounting, ranging from but not limited to impact on aerodynamics, blade integrity, and lightning strike vulnerability, and proposed solutions to those challenges should be addressed. Additionally, to the extent possible please provide any evidence or indication of a turbine manufacturer's willingness to integrate such blade-mounted solutions.

- Applications for deterrent technologies should include evidence of effectiveness to date (including citations where possible) and biological justification of why the specific deterrent stimulus was selected and likely to induce the desired response over time. Consideration of potential for habituation and how those risks have or will be minimized should also be discussed.

- For field testing under these awards, applications should provide a detailed description of plans for field testing, including proposed methodological approach, and the proposed field study site. It should be noted, however, that during award negotiation DOE will review the methodology, and will ask awardees to develop a final agreed-upon methodology before beginning research. DOE may also subject research plans to independent peer review prior to award or inception of research activities. Additionally, EERE strongly encourages teams to include biologists or consultants capable of conducting the validation tests. Those biologist should be charged with establishing methodologies and conducting effectiveness trials in an independent fashion to ensure neutrality of results.

- Data on or plans to ensure component and system survivability/ruggedness in the field should be detailed.

Awardees under Topic Area 3 will be asked to produce an end-of-project analysis of technical performance and of the full costs of the technology.

Teams must also already have, or show the ability to obtain, any necessary permits or authorizations in a timely manner. Applications should discuss the types of permits/authorizations anticipated to be required to carry out project scope and plans to obtain such permits/authorizations. Teams must confer with the U.S. Fish and Wildlife Service and/or the National Oceanic and Atmospheric Administration (NOAA) to determine the appropriate permits, authorizations, or other requirements necessary for the proposed research and wind energy facilities. Note that issuance of a cooperative agreement from this program does not authorize the take of bats, does not commit the government to enter into any settlement agreement, and does not in any way affect the enforcement of the ESA, Marine Mammal Protection Act (MMPA), or other wildlife laws.

Specific deliverables will include, but are not limited to:

1) Quarterly reports and presentations to DOE outlining progress made on all awarded tasks,
2) Annual technical reports for multi-year awards,
3) A peer-reviewed, publicly available, final report that includes a detailed technical summary of all tasks, results of performance testing, and cost analysis,
4) Participation in WETO Program Peer Review activities occurring during or within 1-2 years following the completion of the project, and
5) Submission of a manuscript on project methodology and results for publication in a peer-reviewed journal for any effectiveness testing.

All work under EERE funding agreements must be performed in the United States. See Section IV.J.3 and Appendix C.

C. Applications Specifically Not of Interest

The following types of applications will be deemed nonresponsive and will not be reviewed or considered (See Section III.D of the FOA):

- Applications that fall outside the technical parameters specified in Section I.B of the FOA, including but not limited to studies seeking to assess or measure populations or distributions of marine species.
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).

D. Authorizing Statutes

The programmatic authorizing statute is granted under EPAct 2005, Section 931(a)(1)(F)

Awards made under this announcement will fall under the purview of 2 CFR Part 200 as amended by 2 CFR Part 910.

II. Award Information

A. Award Overview

Estimated Funding

EERE expects to make approximately $6,000,000 of Federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making approximately 6-8 awards under this FOA. EERE may issue one, multiple, or no awards. Individual awards may vary between $500,000 and $1 million.

EERE may issue awards in one, multiple, or none of the following topic areas:

Topic Area 1: Advancing Smart Curtailment Strategies. EERE anticipates issuing approximately 2 awards in this topic area, with a maximum award amount of $1,000,000.

Topic Area 2: Advanced Component Research and Development. EERE anticipates issuing approximately 2-4 awards in this topic area, with an award amount of $500,000 to $1,000,000.

Topic Area 3: Development and Validation of Offshore Wind Monitoring and Mitigation Technologies. EERE may issue approximately 2 awards in this topic area, with a maximum award amount $1,000,000.

EERE may establish more than one budget period for each award and fund only the initial budget period(s). Funding for all budget periods, including the initial budget period, is not guaranteed.

Period of Performance

EERE anticipates making awards that will run from 24 to 36 months in length, comprised of one or more budget periods. Project continuation will be

contingent upon satisfactory performance and go/no-go decision review. At the go/no-go decision points, EERE will evaluate project performance, project schedule adherence, meeting milestone objectives, compliance with reporting requirements, and overall contribution to the program goals and objectives. As a result of this evaluation, EERE will make a determination to continue the project, re-direct the project, or discontinue funding the project.

New Applications Only

EERE will accept only new applications under this FOA. EERE will not consider applications for renewals of existing EERE-funded awards through this FOA.

B. EERE Funding Agreements

Through Cooperative Agreements and other similar agreements, EERE provides financial and other support to projects that have the potential to realize the FOA objectives. EERE does not use such agreements to acquire property or services for the direct benefit or use of the United States Government.

Cooperative Agreements

EERE generally uses Cooperative Agreements to provide financial and other support to Prime Recipients.

Through Cooperative Agreements, EERE provides financial or other support to accomplish a public purpose of support or stimulation authorized by Federal statute. Under Cooperative Agreements, the Government and Prime Recipients share responsibility for the direction of projects.

EERE has substantial involvement in all projects funded via Cooperative Agreement. See Section VI.B.9 of the FOA for more information on what substantial involvement may involve.

Funding Agreements with FFRDCs

In most cases, Federally Funded Research and Development Centers (FFRDC) are funded independently of the remainder of the Project Team. The FFRDC then executes an agreement with any non-FFRDC Project Team members to arrange work structure, project execution, and any other matters. Regardless of these arrangements, the entity that applied as the Prime Recipient for the project will remain the Prime Recipient for the project.

III. Eligibility Information

To be considered for substantive evaluation, an applicant's submission must meet the criteria set forth below. If the application does not meet these initial requirements, it will be considered non-responsive, removed from further evaluation, and ineligible for any award.

A. Eligible Applicants

Individuals

U.S. citizens and lawful permanent residents are eligible to apply for funding as a Prime Recipient or Subrecipient.

Domestic Entities

For-profit entities, educational institutions, and nonprofits that are incorporated (or otherwise formed) under the laws of a particular State or territory of the United States are eligible to apply for funding as a Prime Recipient or Subrecipient. Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995, are not eligible to apply for funding.

State, local, and tribal government entities are eligible to apply for funding as a Prime Recipient or Subrecipient.

DOE/NNSA Federally Funded Research and Development Centers (FFRDCs) are eligible to apply for funding as a Prime Recipient or Subrecipient.

Non-DOE/NNSA FFRDCs are eligible to apply for funding as a Subrecipient, but are not eligible to apply as a Prime Recipient.

Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a Subrecipient, but are not eligible to apply as a Prime Recipient.

Foreign Entities

Foreign entities, whether for-profit or otherwise, are eligible to apply for funding under this FOA. Other than as provided in the "Individuals" or "Domestic Entities" sections above, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. If a foreign entity applies for funding as a Prime Recipient, it must designate in the Full Application a subsidiary or affiliate incorporated (or otherwise formed) under the laws of a State or territory of the United States to be the Prime Recipient. The Full Application must state the nature of the corporate relationship between the foreign entity and domestic subsidiary or affiliate.

Foreign entities may request a waiver of the requirement to designate a subsidiary in the United States as the Prime Recipient in the Full Application (i.e., a foreign entity may request that it remains the Prime Recipient on an award). To do so, the Applicant must submit an explicit written waiver request in the Full Application. Appendix C lists the necessary information that must be included in a request to waive this requirement. The applicant does not have the right to appeal EERE's decision concerning a waiver request.

In the waiver request, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the Prime Recipient. EERE may require additional information before considering the waiver request.

A foreign entity may receive funding as a Subrecipient.

Incorporated Consortia

Incorporated consortia, which may include domestic and/or foreign entities, are eligible to apply for funding as a Prime Recipient or Subrecipient. For consortia incorporated (or otherwise formed) under the laws of a State or territory of the United States, please refer to "Domestic Entities" above. For consortia incorporated in foreign countries, please refer to the requirements in "Foreign Entities" above.

Each incorporated consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium must

provide a written description of its internal governance structure and its internal rules to the EERE Contracting Officer.

Unincorporated Consortia

Unincorporated Consortia, which may include domestic and foreign entities, must designate one member of the consortium to serve as the Prime Recipient/consortium representative. The Prime Recipient/consortium representative must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. The eligibility of the consortium will be determined by the eligibility of the Prime Recipient/consortium representative under Section III.A of the FOA.

Upon request, unincorporated consortia must provide the EERE Contracting Officer with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each consortium member. This agreement binds the individual consortium members together and should discuss, among other things, the consortium's:

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members' efforts on the project;
- Provisions for members' cost sharing contributions; and
- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

B. Cost Sharing

Topic Areas 1 & 3: Cost Share 20%

The cost share must be at least 20% of the total allowable costs for research and development projects (i.e., the sum of the Government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) and must come from non-Federal sources unless otherwise allowed by law. (See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.)

To assist applicants in calculating proper cost share amounts, EERE has included a cost share information sheet and sample cost share calculation as Appendices B and C to this FOA.

Topic Area 2: Cost Share 20% and 50%

The cost share must be at least 20% of the total allowable costs (i.e., the sum of the Government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) for research and development projects. For Topic Area 2 only: project tasks that involve efficacy validation efforts conducted at wind farms will require 50% cost share.

To assist applicants in calculating proper cost share amounts, EERE has included a cost share information sheet and sample cost share calculation as Appendices B and C to this FOA.

Legal Responsibility

Although the cost share requirement applies to the project as a whole, including work performed by members of the project team other than the Prime Recipient, the Prime Recipient is legally responsible for paying the entire cost share. The Prime Recipient's cost share obligation is expressed in the Assistance Agreement as a static amount in U.S. dollars (cost share amount) and as a percentage of the Total Project Cost (cost share percentage). If the funding agreement is terminated prior to the end of the project period, the Prime Recipient is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination.

The Prime Recipient is solely responsible for managing cost share contributions by the Project Team and enforcing cost share obligation assumed by Project Team members in subawards or related agreements.

Cost Share Allocation

Each Project Team is free to determine how best to allocate the cost share requirement among the team members. The amount contributed by individual Project Team members may vary, as long as the cost share requirement for the project as a whole is met.

Cost Share Types and Allowability

Every cost share contribution must be allowable under the applicable Federal cost principles, as described in Section IV.J.1 of the FOA. In addition, cost share must be verifiable upon submission of the Full Application.

Project Teams may provide cost share in the form of cash or in-kind contributions. Cost share may be provided by the Prime Recipient, Subrecipients, or third parties (entities that do not have a role in performing the scope of work). Vendors/Contractors may not provide cost share. Any partial donation of goods or services is considered a discount and is not allowable.

Cash contributions include, but are not limited to: personnel costs, fringe costs, supply and equipment costs, indirect costs and other direct costs.

In-kind contributions are those where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. Allowable in-kind contributions include, but are not limited to: the donation of volunteer time or the donation of space or use of equipment.

Project teams may use funding or property received from state or local governments to meet the cost share requirement, so long as the funding was not provided to the state or local government by the Federal Government.

The Prime Recipient may not use the following sources to meet its cost share obligations including, but not limited to:

- Revenues or royalties from the prospective operation of an activity beyond the project period;
- Proceeds from the prospective sale of an asset of an activity;
- Federal funding or property (e.g., Federal grants, equipment owned by the Federal Government); or
- Expenditures that were reimbursed under a separate Federal Program.

Project Teams may not use the same cash or in-kind contributions to meet cost share requirements for more than one project or program.

Cost share contributions must be specified in the project budget, verifiable from the Prime Recipient's records, and necessary and reasonable for proper

and efficient accomplishment of the project. As all sources of cost share are considered part of total project cost, the cost share dollars will be scrutinized under the same Federal regulations as Federal dollars to the project. Every cost share contribution must be reviewed and approved in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred.

Applicants are encouraged to refer to 2 CFR 200.306 as amended by 2 CFR 910.130 & 10 CFR 603.525-555 for additional guidance on cost sharing.

Cost Share Contributions by FFRDCs

Because FFRDCs are funded by the Federal Government, costs incurred by FFRDCs generally may not be used to meet the cost share requirement. FFRDCs may contribute cost share only if the contributions are paid directly from the contractor's Management Fee or another non-Federal source.

Cost Share Verification

Applicants are required to provide written assurance of their proposed cost share contributions in their Full Applications.

Upon selection for award negotiations, applicants are required to provide additional information and documentation regarding their cost share contributions. Please refer to Appendix A of the FOA.

Cost Share Payment

EERE requires Prime Recipients to contribute the cost share amount incrementally over the life of the award. Specifically, the Prime Recipient's cost share for each billing period must always reflect the overall cost share ratio negotiated by the parties (i.e., the total amount of cost sharing on each invoice when considered cumulatively with previous invoices must reflect, at a minimum, the cost sharing percentage negotiated). As FFRDC funding will be provided directly to the FFRDC(s) by DOE, Prime Recipients will be required to provide project cost share at a percentage commensurate with the FFRDC costs, on a budget period basis, resulting in a higher interim invoicing cost share ratio than the total award ratio.

In limited circumstances, and where it is in the government's interest, the EERE Contracting Officer may approve a request by the Prime Recipient to meet its cost share requirements on a less frequent basis, such as monthly or quarterly. Regardless of the interval requested, the Prime Recipient must be

up-to-date on cost share at each interval. Such requests must be sent to the Contracting Officer during award negotiations and include the following information: (1) a detailed justification for the request; (2) a proposed schedule of payments, including amounts and dates; (3) a written commitment to meet that schedule; and (4) such evidence as necessary to demonstrate that the Prime Recipient has complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they go into effect.

C. Compliance Criteria

Concept Papers and Full Applications must meet all Compliance criteria listed below or they will be considered noncompliant. EERE will not review or consider noncompliant submissions, Concept Papers, Full Applications, and Replies to Reviewer Comments that were: submitted through means other than EERE Exchange; submitted after the applicable deadline; and/or submitted incomplete. EERE will not extend the submission deadline for applicants that fail to submit required information due to server/connection congestion.

Compliance Criteria

1. **Concept Papers**

   Concept Papers are deemed compliant if:

   - The Concept Paper complies with the content and form requirements in Section IV.C of the FOA; and
   - The applicant successfully uploaded all required documents and clicked the "Submit" button in EERE Exchange by the deadline stated in this FOA.

2. **Full Applications**

   Full Applications are deemed compliant if:

   - The applicant submitted a compliant Concept Paper;
   - The Full Application complies with the content and form requirements in Section IV.D of the FOA; and
   - The applicant successfully uploaded all required documents and clicked the "Submit" button in EERE Exchange by the deadline stated in the FOA.

3. **Replies to Reviewer Comments**

Replies to Reviewer Comments are deemed compliant if:

- The Reply to Reviewer Comments complies with the content and form requirements in Section IV.E of the FOA; and
- The applicant successfully uploaded all required documents to EERE Exchange by the deadline stated in the FOA.

D. Responsiveness Criteria

All "Applications Specifically Not of Interest," as described in Section I.C of the FOA, are deemed nonresponsive and are not reviewed or considered.

E. Other Eligibility Requirements

Requirements for DOE/NNSA Federally Funded Research and Development Centers (FFRDC) Listed as the Applicant

A DOE/NNSA FFRDC is eligible to apply for funding under this FOA if its cognizant Contracting Officer provides written authorization and this authorization is submitted with the application. If a DOE/NNSA FFRDC is selected for award negotiation, the proposed work will be authorized under the DOE work authorization process and performed under the laboratory's Management and Operating (M&O) contract.

The following wording is acceptable for the authorization:

Authorization is granted for the [Enter Laboratory Name] Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

Requirements for DOE/NNSA and non-DOE/NNSA Federally Funded Research and Development Centers Included as a Subrecipient

DOE/NNSA and non-DOE/NNSA FFRDCs may be proposed as a Subrecipient on another entity's application subject to the following guidelines:

1. Authorization for non-DOE/NNSA FFRDCs

The Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with its authority under its award.

2. **Authorization for DOE/NNSA FFRDCs**
   The cognizant Contracting Officer for the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The following wording is acceptable for this authorization:

   Authorization is granted for the [Enter Laboratory Name] Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

3. **Value/Funding**
   The value of and funding for the FFRDC portion of the work will not normally be included in the award to a successful applicant. Usually, DOE will fund a DOE/NNSA FFRDC contractor through the DOE field work proposal system and non-DOE/NNSA FFRDC through an interagency agreement with the sponsoring agency.

4. **Cost Share**
   Although the FFRDC portion of the work is usually excluded from the award to a successful applicant, the applicant's cost share requirement will be based on the total cost of the project, including the applicant's and the FFRDC's portions of the project.

5. **Responsibility**
   The Prime Recipient will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues including, but not limited to disputes and claims arising out of any agreement between the Prime Recipient and the FFRDC contractor.

6. **Limit on FFRDC Effort when FFRDC is not the Prime Applicant**
   The scope of work to be performed by the FFRDC may not be more significant than the scope of work to be performed by the applicant.

F. Limitation on Number of Concept Papers and Full Applications Eligible for Review

Applicants may submit more than one Concept Paper and one Full Application to this FOA, provided that each application describes a unique, scientifically distinct project.

G. Questions Regarding Eligibility

EERE will not make eligibility determinations for potential applicants prior to the date on which applications to this FOA must be submitted. The decision whether to submit an application in response to this FOA lies solely with the applicant.

IV. Application and Submission Information

A. Application Process

The application process will include two phases: a Concept Paper phase and a Full Application phase. **Only applicants who have submitted an eligible Concept Paper will be eligible to submit a Full Application**. At each phase, EERE performs an initial eligibility review of the applicant submissions to determine whether they meet the eligibility requirements of Section III of the FOA. EERE will not review or consider submissions that do not meet the eligibility requirements of Section III. All submissions must conform to the following form and content requirements, including maximum page lengths (described below) and must be submitted via EERE Exchange at https://eere-exchange.energy.gov/, unless specifically stated otherwise. **EERE will not review or consider submissions submitted through means other than EERE Exchange, submissions submitted after the applicable deadline, and incomplete submissions**. EERE will not extend deadlines for applicants who fail to submit required information and documents due to server/connection congestion. A control number will be issued when an applicant begins the EERE Exchange application process. This control number must be included with all Application documents, as described below.

The Concept Paper, Full Application, and Reply to Reviewer Comments must conform to the following requirements:

- Each must be submitted in Adobe PDF format unless stated otherwise.
- Each must be written in English.

- All pages must be formatted to fit on 8.5 x 11 inch paper with margins not less than one inch on every side. Use Times New Roman typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement.
- The Control Number must be prominently displayed on the upper right corner of the header of every page. Page numbers must be included in the footer of every page.
- Each submission must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

Applicants are responsible for meeting each submission deadline. **Applicants are strongly encouraged to submit their Concept Papers and Full Applications at least 48 hours in advance of the submission deadline**. Under normal conditions (i.e., at least 48 hours in advance of the submission deadline), applicants should allow at least 1 hour to submit a Concept Paper, Full Application, or Reply to Reviewer Comments. Once the Concept Paper, Full Application, or Reply to Reviewer Comments is submitted in EERE Exchange, applicants may revise or update that submission until the expiration of the applicable deadline. If changes are made, the applicant must resubmit the Concept Paper, Full Application, or Reply to Reviewer Comments before the applicable deadline.

EERE urges applicants to carefully review their Concept Papers, and Full Applications and to allow sufficient time for the submission of required information and documents. All Full Applications that pass the initial eligibility review will undergo comprehensive technical merit review according to the criteria identified in Section V.A.2 of the FOA.

Additional Information on EERE Exchange

EERE Exchange is designed to enforce the deadlines specified in this FOA. The "Apply" and "Submit" buttons will automatically disable at the defined submission deadlines. Should applicants experience problems with EERE Exchange, the following information may be helpful.

Applicants that experience issues with submission PRIOR to the FOA deadline: In the event that an applicant experiences technical difficulties with a submission, the Application should contact the EERE Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The EERE Exchange helpdesk and/or the EERE Exchange system administrators will assist Applicants in resolving issues.

Applicants that experience issue with submissions that result in late submissions: In the event that an applicant experiences technical difficulties so severe that they are unable to submit their application by the deadline, the applicant should contact the EERE Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The EERE Exchange helpdesk and/or the EERE Exchange system administrators will assist the applicant in resolving all issues (including finalizing submission on behalf of and with the applicant's concurrence). PLEASE NOTE, however, those applicants who are unable to submit their application on time due to their waiting until the last minute when network traffic is at its heaviest to submit their materials will not be able to use this process.

B. Application Forms

The application forms and instructions are available on EERE Exchange. To access these materials, go to https://eere-Exchange.energy.gov and select the appropriate funding opportunity number.

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA, it must be broken into parts and denoted to that effect. For example:
ControlNumber_LeadOrganization_Project_Part_1
ControlNumber_LeadOrganization_Project_Part_2, etc.

C. Content and Form of the Concept Paper

To be eligible to submit a Full Application, applicants must submit a Concept Paper by the specified due date and time.

Concept Paper Content Requirements

EERE will not review or consider ineligible Concept Papers (see Section III of the FOA).

Each Concept Paper must be limited to a single concept or technology. Unrelated concepts and technologies should not be consolidated into a single Concept Paper.

The Concept Paper must conform to the following content requirements:

Section	Page Limit	Description
Cover Page	1 page maximum	The cover page should include the project title, the specific FOA Topic Area being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Technology or Research Description	3 pages maximum	Applicants are required to describe succinctly: • The proposed technology or research, including its basic scientific principles and how the work is unique and innovative; • The proposed research goals or technology's target level of performance; (applicants should provide technical data or other support to show how the proposed target could be met); • The current state-of-the-art or science in the relevant field and application, including key shortcomings, limitations, and challenges; • How the proposed technology or research will overcome the shortcomings, limitations, and challenges in the relevant field and application; • The potential impact that the proposed project would have on the relevant field and application; • The key technical risks/issues associated with the proposed technology development plan; and • The impact that DOE funding would have on the proposed project.
Addendum	2 pages maximum	Applicants are required to describe succinctly the qualifications, experience, and capabilities of the proposed Project Team, including: • Whether the Principal Investigator (PI) and Project Team have the skill and expertise needed to successfully execute the project plan;

		• Whether the applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity; • Whether the applicant has worked together with its teaming partners on prior projects or programs; and • Whether the applicant has adequate access to equipment and facilities necessary to accomplish the effort and/or clearly explain how it intends to obtain access to the necessary equipment and facilities. Applicants may provide graphs, charts, or other data to supplement their Technology Description.

EERE makes an independent assessment of each Concept Paper based on the criteria in Section V.A.i of the FOA. EERE will encourage a subset of applicants to submit Full Applications. Other applicants will be discouraged from submitting a Full Application. An applicant who receives a "discouraged" notification may still submit a Full Application. EERE will review all eligible Full Applications. However, by discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project in an effort to save the applicant the time and expense of preparing an application that is unlikely to be selected for award negotiations.

EERE may include general comments provided from reviewers on an applicant's Concept Paper in the encourage/discourage notification posted on EERE Exchange at the close of that phase.

D. Content and Form of the Full Application

Applicants must submit a Full Application by the specified due date and time to be considered for funding under this FOA. Applicants must complete the following application forms found on the EERE Exchange website at https://eere-Exchange.energy.gov/, in accordance with the instructions.

Applicants will have approximately 30 days from receipt of the Concept Paper Encourage/Discourage notification on EERE Exchange to prepare and submit a Full Application. Regardless of the date the applicant receives the Encourage/Discourage notification, the submission deadline for the Full Application remains the date and time stated on the FOA cover page.

All Full Application documents must be marked with the Control Number issued to the applicant.

Full Application Content Requirements

EERE will not review or consider ineligible Full Applications (see Section III of the FOA).

Each Full Application shall be limited to a single concept or technology. Unrelated concepts and technologies shall not be consolidated in a single Full Application.

Full Applications must conform to the following requirements:

Submission	Components	File Name
Full Application (PDF, unless stated otherwise)	Technical Volume (See Chart in Section IV.D.2)	ControlNumber_LeadOrganization_TechnicalVolume
	Statement of Project Objectives (Microsoft Word format) (10 page limit)	ControlNumber_LeadOrganization_SOPO
	SF-424	ControlNumber_LeadOrganization_App424
	Budget Justification (EERE 335) (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Budget_Justification
	Summary for Public Release (1 page limit)	ControlNumber_LeadOrganization_Summary
	Summary Slide (1 page limit, Microsoft PowerPoint format)	ControlNumber_LeadOrganization_Slide
	Subrecipient Budget Justification, if applicable (EERE 335) (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
	Budget for FFRDC, if applicable (see below for required form)	ControlNumber_LeadOrganization_FWP
	Authorization from cognizant Contracting Officer for FFRDC, if applicable	ControlNumber_LeadOrganization_FFRDCAuth
	SF-LLL Disclosure of Lobbying Activities	ControlNumber_LeadOrganization_SF-LLL
	Foreign Entity and Performance of Work in the United States waiver requests, if applicable	ControlNumber_LeadOrganization_Waiver
	U.S. Manufacturing Plans (Topic Areas 2 and 3 only)	ControlNumber_LeadOrganization_USMP

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA it must be broken into parts and denoted to that effect. For example:

ControlNumber_LeadOrganization_TechnicalVolume_Part_1
ControlNumber_LeadOrganization_TechnicalVolume_Part_2, etc.

EERE will not accept late submissions that resulted from technical difficulties due to uploading files that exceed 10MB.

EERE provides detailed guidance on the content and form of each component below.

Technical Volume

The Technical Volume must be submitted in Adobe PDF format. The Technical Volume must conform to the following content and form requirements, including maximum page lengths. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages. This volume must address the Merit Review Criteria as discussed in Section V.A.2 of the FOA. Save the Technical Volume in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_TechnicalVolume".

Applicants must provide sufficient citations and references to the primary research literature to justify the claims and approaches made in the Technical Volume. However, EERE and reviewers are under no obligation to review cited sources.

The Technical Volume to the Full Application may not be more than 25 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.2 of the FOA) when preparing the Technical Volume.

SECTION/PAGE LIMIT	DESCRIPTION
	The cover page should include the project title, the specific FOA Topic Area being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Project Overview (This section should constitute approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Technical Description, Innovation, and Impact (This section should constitute approximately 30% of the Technical Volume)	The Technical Description should contain the following information: • Relevance and Outcomes: The applicant should provide a detailed description of the technology or research, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology or research and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. • Innovation and Impacts: The applicant should describe the current state of the art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies or solutions, and the overall impact on advancing the state of the art/technical baseline if the project is successful.
Workplan and Market Transformation Plan (This section should	The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure, Milestones, Go/No-Go Decision Points, and Project Schedule. A detailed Statement of Project

constitute approximately 40% of the Technical Volume)	Objectives (SOPO) is separately requested. The Workplan should contain the following information: • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on go/no-go decision points). The applicant should describe the specific expected end result of each performance period. • Work Breakdown Structure (WBS) and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard work breakdown structure (WBS) for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO.

	• Go/No-Go Decision Points: The applicant should provide a summary of project-wide go/no-go decision points at appropriate points in the Workplan. A go/no-go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one project-wide go/no-go decision point for each budget period (12 to 18-month period) of the project. The Applicant should also provide the specific technical criteria to be used to make the go/no-go decision. The summary provided should be consistent with the SOPO. Go/no-go decision points are considered "SMART" and can fulfill the requirement for an annual SMART milestone.
	• End of Project Goal: The applicant should provide a summary of the end of project goal(s). Unless otherwise specified in the FOA, the minimum requirement is that each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO.
	• Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and go/no-go decision points.
	• Project Management: The applicant should discuss the team's proposed management plan, including the following:
	  o The overall approach to and organization for managing the work
	  o The roles of each Project Team member
	  o Any critical handoffs/interdependencies among Project Team members
	  o The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices
	  o The approach to project risk management
	  o A description of how project changes will be handled
	  o If applicable, the approach to Quality Assurance/Control
	  o How communications will be maintained among Project Team members
	
	• Market Transformation Plan: The applicant should provide a market transformation plan, including the following:
	  o Identification of target market, competitors, and distribution channels for proposed technology along with

	known or perceived barriers to market penetration, including a mitigation plan o Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, U.S. manufacturing plan (Topic Areas 2 and 3 only) etc., and product distribution.
Technical Qualifications and Resources (Approximately 20% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information: • Describe the Project Team's unique qualifications and expertise, including those of key Subrecipients. • Describe the Project Team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project. • Attach one-page resumes for key participating team members as an appendix. Resumes do not count towards the page limit. Multi-page resumes are not allowed. • Describe the technical services to be provided by DOE/NNSA FFRDCs and Government Owned Government Operated (GOGO) facilities, if applicable • Attach letters of commitment from all Subrecipient/third party cost share providers as an appendix. Letters of commitment do not count towards the page limit. • Attach any letters of commitment from partners/end users as an appendix (1 page maximum per letter). Letters of commitment do not count towards the page limit. • For multi-organizational or multi-investigator projects, describe succinctly: o The roles and the work to be performed by each PI and Key Participant; o Business agreements between the applicant and each PI and Key Participant; o How the various efforts will be integrated and managed; o Process for making decisions on scientific/technical direction; o Publication arrangements; o Intellectual Property issues; and

	o Communication plans
FOA-Specific Requirements	• Description of permits or authorizations to conduct research received to date. If none, description of plan and anticipated schedule for application and securement of permits

Statement of Project Objectives

Applicants are required to complete a Statement of Project Objectives (SOPO). A SOPO template is available on EERE Exchange at https://eere-Exchange.energy.gov/. The SOPO, including the Milestone Table, must not exceed 10 pages when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the SOPO in a single Microsoft Word file using the following convention for the title "ControlNumber_LeadOrganization_SOPO".

SF-424: Application for Federal Assistance

Complete all required fields in accordance with the instructions on the form. The list of certifications and assurances in Field 21 can be found at http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms, under Certifications and Assurances. Note: The dates and dollar amounts on the SF-424 are for the complete project period and not just the first project year, first phase or other subset of the project period. Save the SF-424 in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_App424".

Budget Justification Workbook (EERE 335)

Applicants are required to complete the Budget Justification Workbook. This form is available on EERE Exchange at https://eere-Exchange.energy.gov/. Prime Recipients must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the Prime Recipient and its Subrecipients and Contractors, and provide all requested documentation (e.g., a Federally-approved rate agreement, vendor quotes). Applicants should include costs associated with required annual audits and incurred cost proposals in their proposed budget documents. The "Instructions and Summary" included with the Budget Justification Workbook will auto-populate as the applicant enters information into the Workbook. Applicants must carefully read the "Instructions and Summary" tab provided within the Budget Justification Workbook. Save the Budget Justification Workbook in a single Microsoft

Excel file using the following convention for the title "ControlNumber_LeadOrganization_Budget_Justification".

Summary/Abstract for Public Release

Applicants are required to submit a one-page summary/abstract of their project. The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (e.g., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as DOE may make it available to the public after selections are made. The project summary must not exceed 1 page when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the Summary for Public Release in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Summary".

Summary Slide

Applicants are required to provide a single PowerPoint slide summarizing the proposed project. The slide must be submitted in Microsoft PowerPoint format. This slide is used during the evaluation process. Save the Summary Slide in a single file using the following convention for the title "ControlNumber_LeadOrganization_Slide".

The Summary Slide template requires the following information:

- A technology Summary;
- A description of the technology's impact;
- Proposed project goals;
- Any key graphics (illustrations, charts and/or tables);
- The project's key idea/takeaway;
- Project title, Prime Recipient, Principal Investigator, and Key Participant information; and
- Requested EERE funds and proposed applicant cost share.

Subrecipient Budget Justification (EERE 335) (if applicable)

Applicants must provide a separate budget justification, EERE 335 (i.e., budget justification for each budget year and a cumulative budget) for each

subrecipient that is expected to perform work estimated to be more than $250,000 or 25 percent of the total work effort (whichever is less). The budget justification must include the same justification information described in the "Budget Justification" section above. Save each subrecipient budget justification in a Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Subrecipient_Budget_Justification".

Budget for DOE/NNSA FFRDC (if applicable)

If a DOE/NNSA FFRDC contractor is to perform a portion of the work, the applicant must provide a DOE Field Work Proposal (FWP) in accordance with the requirements in DOE Order 412.1, Work Authorization System. DOE Order 412.1 and DOE O 412.1 (Field Work Proposal form) area available at the following link, under "DOE Budget Forms": https://www.directives.doe.gov/directives-documents/400-series/0412.1-BOrder-a-admchg1/@@images/file. Save the FWP in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FWP".

Authorization for non-DOE/NNSA or DOE/NNSA FFRDCs (if applicable)

The Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with the contractor's authority under its award. Save the Authorization in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FFRDCAuth".

SF-LLL: Disclosure of Lobbying Activities (required)

Prime Recipients and Subrecipients may not use any Federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Prime Recipients and Subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to ensure that non-Federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with your application:

- An officer or employee of any Federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

Save the SF-LLL in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_SF-LLL".

Waiver Requests: Foreign Entities and Performance of Work in the United States (if applicable)

1. **Foreign Entity Participation**:
   As set forth in Section III.A.3, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. To request a waiver of this requirement, the applicant must submit an explicit waiver request in the Full Application. Appendix C lists the necessary information that must be included in a request to waive this requirement.

2. **Performance of Work in the United States**
   As set forth in Section IV.K.iii, all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. Appendix C lists the necessary information that must be included in a request to waive the Performance of Work in the United States requirement.

U.S. Manufacturing Commitments

Topic Area 2 and 3 only
As part of the application, applicants are required to submit a U.S. Manufacturing Plan. The U.S. Manufacturing Plan represents the applicant's measurable commitment to support U.S. manufacturing as a result of its award.

The weight given to the U.S. Manufacturing Plans during the review and selection process varies based on the particular FOA. Applicants should

review Section V.A.2 of this FOA to determine the weight given to the U.S. Manufacturing Plans under this FOA.

A U.S. Manufacturing Plan should contain the following or similar preamble: "If selected for funding, the applicant agrees to the following commitments as a condition of that funding:" and, after the preamble, the plan should include one or more specific and measureable commitments. For example, an applicant may commit particular types of products to be manufactured in the U.S. In addition to or instead of making a commitment tied to a particular product, the applicant may make other types of commitments still beneficial to U.S. manufacturing. An applicant may commit to a particular investment in a new or existing U.S. manufacturing facility, keep certain activities based in the U.S. (i.e., final assembly) or support a certain number of jobs in the U.S. related to the technology and manufacturing. For an applicant which is likely to license the technology to others, especially universities for which licensing may be the exclusive means of commercialization the technology, the U.S. manufacturing plan may indicate the applicant's plan and commitment to use a licensing strategy that would likely support U.S. manufacturing.

When an applicant that is a domestic small business, domestic educational institution, or nonprofit organization is selected for an award, the U.S. Manufacturing Plan submitted by the applicant becomes part of the terms and conditions of the award. The applicant/awardee may request a waiver or modification of the U.S. Manufacturing Plan from DOE upon a showing that the original U.S. Manufacturing Plan is no longer economically feasible.

When an applicant that is a domestic large business is selected for an award, a class patent waiver applies as set forth in Section VIII. L. Under this class patent waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class patent waiver, a domestic large business must agree that any products embodying or produced through the use of an invention conceived or first actually reduced to practice under the award will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan are sufficient.

For other entity types that are selected for award, please see Section VIII.L regarding U.S. manufacturing commitments.

Topic Area 1 Only:
EERE requires subject inventions (i.e., inventions conceived or first actually reduced to practice under EERE awards) to be substantially manufactured in the United States by Project Teams and their licensees, as described below. The applicant may request a modification or waiver of the U.S. Manufacturing Requirement.

1. **Domestic Small Businesses, Educational Institutions and Nonprofits**
   Domestic Small businesses (including Small Business concerns), domestic educational institutions, and nonprofits that are Recipients or Subrecipients under EERE funding agreements must require their exclusive licensees to substantially manufacture the following products in the United States for any use or sale in the United States: (1) articles embodying subject inventions, and (2) articles produced through the use of subject inventions. This requirement does not apply to articles that are manufactured for use or sale overseas.

   Domestic small businesses, domestic educational institutions and nonprofits must require their assignees to apply the same U.S. Manufacturing requirements to their exclusive licensees.

   These U.S. Manufacturing requirements do not apply to nonexclusive licensees.

2. **Large Businesses, Foreign Entities, and State and Local Government Entities**
   Large businesses and foreign entities that are Recipients or Subrecipients under EERE funding agreements that take title to subject inventions through a patent waiver are required to substantially manufacture the following products in the United States: (1) products embodying subject inventions, and (2) products produced through the use of subject invention(s). This requirement applies to products that are manufactured for use or sale in the United States or overseas.

   Large businesses and foreign entities must apply the same U.S. Manufacturing requirements to their assignees, licensees, and entities acquiring a controlling interest in the large business or foreign entity. Large businesses and foreign entities must require their

assignees and entities acquiring a controlling interest in the large business or foreign entity to apply the same U.S. Manufacturing requirements to their licensees.

3. **FFRDCs**
   DOE FFRDCs are subject to the U.S. Manufacturing requirements set forth in their Management and Operating Contracts. All other FFRDCs are subject to the U.S. Manufacturing requirements as set forth above, based on their size and for-profit status.

Data Management Plan

Applicants whose Full Applications are selected for award negotiations will be required to submit a Data Management Plan during the award negotiations phase. The Data Management Plan is a document that outlines the proposed plan for data sharing or preservation. Submission of this plan is required, and failure to submit the plan may result in the termination of award negotiations. As a courtesy, guidance for preparing a Data Management Plan is provided in Appendix D of the FOA.

E. Content and Form of Replies to Reviewer Comments

EERE will provide applicants with reviewer comments following evaluation of all eligible Full Applications. Applicants will have a brief opportunity to review the comments and to prepare a short Reply to Reviewer Comments responding to comments however they desire or supplementing their Full Application. The Reply to Reviewer Comments is an optional submission; applicants are not required to submit a Reply to Reviewer Comments. EERE will post the Reviewer Comments in EERE Exchange. The expected submission deadline is on the cover page of the FOA; however, it is the applicant's responsibility to monitor EERE Exchange in the event that the expected date changes. The deadline will not be extended for applicants who are unable to timely submit their reply due to failure to check EERE Exchange or relying on the expected date alone. Applicants should anticipate having approximately three (3) business days to submit Replies to Reviewer Comments.

EERE will not review or consider ineligible Replies to Reviewer Comments (see Section III of the FOA). EERE will review and consider each eligible Full Application, even if no Reply is submitted or if the Reply is found to be ineligible.

Replies to Reviewer Comments must conform to the following content and form requirements, including maximum page lengths, described below. If a Reply to Reviewer Comments is more than three pages in length, EERE will review only the first three (3) pages and disregard any additional pages.

SECTION	PAGE LIMIT	DESCRIPTION
Text	2 pages max	Applicants may respond to one or more reviewer comments or supplement their Full Application.
Optional	1 page max	Applicants may use this page however they wish; text, graphs, charts, or other data to respond to reviewer comments or supplement their Full Application are acceptable.

F. Post-Award Information Requests

If selected for award, EERE reserves the right to request additional or clarifying information for any reason deemed necessary, including but not limited to:

- Indirect cost information
- Other budget information
- Commitment Letters from Third Parties Contributing to Cost Share, if applicable
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5)
- Representation of Limited Rights Data and Restricted Software, if applicable
- Environmental Questionnaire

G. Dun and Bradstreet Universal Numbering System Number and System for Award Management

Each applicant (unless the applicant is an individual or Federal awarding agency that is excepted from those requirements under 2 CFR §25.110(b) or (c), or has an exception approved by the Federal awarding agency under 2 CFR §25.110(d)) is required to: (1) Be registered in the System for Award Management (SAM) at https://www.sam.gov before submitting its application; (2) provide a valid Dun and Bradstreet Universal Numbering System (DUNS) number in its application; and (3) continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency. DOE may not make a Federal award

to an applicant until the applicant has complied with all applicable DUNS and SAM requirements and, if an applicant has not fully complied with the requirements by the time DOE is ready to make a Federal award, the DOE may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

H. Submission Dates and Times

Concept Papers, Full Applications, and Replies to Reviewer Comments must be submitted in EERE Exchange no later than 5 p.m. Eastern on the dates provided on the cover page of this FOA.

I. Intergovernmental Review

Technology Office not subject to Executive Order 12372
This FOA is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

J. Funding Restrictions

Allowable Costs

All expenditures must be allowable, allocable, and reasonable in accordance with the applicable Federal cost principles.

Refer to the following applicable Federal cost principles for more information:

- FAR Part 31 for For-Profit entities; and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

Pre-Award Costs

Selectees must request prior written approval to charge pre-award costs. Pre-award costs are those incurred prior to the effective date of the Federal award directly pursuant to the negotiation and in anticipation of the Federal award where such costs are necessary for efficient and timely performance of the scope of work. Such costs are allowable only to the extent that they would have been allowable if incurred after the date of the Federal award

and **only** with the written approval of the Federal awarding agency, through the Contracting Officer assigned to the award.

Pre-award costs cannot be incurred prior to the Selection Official signing the Selection Statement and Analysis. Pre-award costs can only be incurred if such costs would be reimbursable under the agreement if incurred after award.

Pre-Award expenditures are made at the Selectee's risk; EERE is not obligated to reimburse costs: (1) in the absence of appropriations; (2) if an award is not made; or (3) if an award is made for a lesser amount than the Selectee anticipated.

1. **Pre-Award Costs Related to National Environmental Policy Act (NEPA) Requirements**
   EERE's decision whether and how to distribute Federal funds under this FOA is subject to NEPA. Applicants should carefully consider and should seek legal counsel or other expert advice before taking any action related to the proposed project that would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to EERE completing the NEPA review process.

   EERE does not guarantee or assume any obligation to reimburse costs where the Prime Recipient incurred the costs prior to receiving written authorization from the Contracting Officer. If the applicant elects to undertake activities that may have an adverse effect on the environment or limit the choice of reasonable alternatives prior to receiving such written authorization from the Contracting Officer, the applicant is doing so at risk of not receiving Federal funding and such costs may not be recognized as allowable cost share. Likewise, if a project is selected for negotiation of award, and the Prime Recipient elects to undertake activities that are not authorized for Federal funding by the Contracting Officer in advance of EERE completing a NEPA review, the Prime Recipient is doing so at risk of not receiving Federal Funding and such costs may not be recognized as allowable cost share. Nothing contained in the pre-award cost reimbursement regulations or any pre-award costs approval letter from the Contracting Officer override these NEPA requirements to obtain the written authorization from the Contracting Officer prior to taking any action that may have an adverse effect on the

environment or limit the choice of reasonable alternatives.

Performance of Work in the United States

1. **Requirement**
   All work performed under EERE Awards must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment; however, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. The Prime Recipient must flow down this requirement to its Subrecipients.

2. **Failure to Comply**
   If the Prime Recipient fails to comply with the Performance of Work in the United States requirement, EERE may deny reimbursement for the work conducted outside the United States and such costs may not be recognized as allowable recipient cost share. The Prime Recipient is responsible should any work under this Award be performed outside the United States, absent a waiver, regardless of if the work is performed by the Prime Recipient, Subrecipients, contractors or other project partners.

3. **Waiver**
   There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit a written waiver request to EERE. Appendix C lists the necessary information that must be included in a request to waive the Performance of Work in the United States requirement.

   The applicant must demonstrate to the satisfaction of EERE that a waiver would further the purposes of the FOA and is in the economic interests of the United States. EERE may require additional information before considering a waiver request. Save the waiver request(s) in a single PDF file titled "ControlNumber_PerformanceofWork_Waiver". The applicant does not have the right to appeal EERE's decision concerning a waiver request.

Construction

Recipients are required to obtain written authorization from the Contracting Officer before incurring any major construction costs.

Foreign Travel

If international travel is proposed for your project, please note that your organization must comply with the International Air Transportation Fair Competitive Practices Act of 1974 (49 USC 40118), commonly referred to as the "Fly America Act," and implementing regulations at 41 CFR 301-10.131 through 301-10.143. The law and regulations require air transport of people or property to, from, between, or within a country other than the United States, the cost of which is supported under this award, to be performed by or under a cost-sharing arrangement with a U.S. flag carrier, if service is available. Foreign travel costs are allowable only with the written prior approval of the Contracting Officer assigned to the award.

Equipment and Supplies

To the greatest extent practicable, all equipment and products purchased with funds made available under this FOA should be American-made. This requirement does not apply to used or leased equipment.

Property disposition will be required at the end of a project if the current fair market value of property exceeds $5,000. The rules for property disposition are set forth in 2 CFR 200.310 – 200.316 as amended by 2 CFR 910.360.

Lobbying

Recipients and Subrecipients may not use any Federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Recipients and Subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to ensure that non-Federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with your application:

- An officer or employee of any Federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

Risk Assessment

Prior to making a Federal award, the DOE is required by 31 U.S.C. 3321 and 41 U.S.C. 2313 to review information available through any OMB-designated repositories of government-wide eligibility qualification or financial integrity information, such as SAM Exclusions and "Do Not Pay."

In addition, DOE evaluates the risk(s) posed by applicants before they receive Federal awards. This evaluation may consider: results of the evaluation of the applicant's eligibility; the quality of the application; financial stability; quality of management systems and ability to meet the management standards prescribed in this part; history of performance; reports and findings from audits; and the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-Federal entities.

In addition to this review, DOE must comply with the guidelines on government-wide suspension and debarment in 2 CFR 180, and must require non-Federal entities to comply with these provisions. These provisions restrict Federal awards, subawards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in Federal programs or activities.

Invoice Review and Approval

DOE employs a risk-based approach to determine the level of supporting documentation required for approving invoice payments. Recipients may be required to provide some or all of the following items with their requests for reimbursement:

- Summary of costs by cost categories
- Timesheets or personnel hours report
- Invoices/receipts for all travel, equipment, supplies, contractual, and other costs
- UCC filing proof for equipment acquired with project funds by for-profit recipients and subrecipients
- Explanation of cost share for invoicing period
- Analogous information for some subrecipients
- Other items as required by DOE

V. Application Review Information

A. Technical Review Criteria

Concept Papers

Concept Papers are evaluated based on consideration the following factors. All sub-criteria are of equal weight.

Concept Paper Criterion: Overall FOA Responsiveness and Viability of the Project (Weight: 100%)

- The applicant clearly describes the proposed technology or research, describes how the technology is unique and innovative, and how the technology will advance the current state-of-the-art;
- The applicant has identified risks and challenges, including possible mitigation strategies, and has shown the impact that EERE funding and the proposed project would have on the relevant field and application;
- The applicant has the qualifications, experience, capabilities and other resources necessary to complete the proposed project; and
- The proposed work, if successfully accomplished, would clearly meet the objectives as stated in the FOA.

Full Applications

Applications will be evaluated against the merit review criteria shown below. All sub-criteria are of equal weight.

Criterion 1: Technical Merit, Innovation, and Impact (50%)

Technical Merit and Innovation

- Extent to which the proposed technology or research is innovative;
- Degree to which the current state of the technology or science and the proposed advancement are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state of the art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technology Advancement

- How the project supports the topic area objectives and target specifications and metrics; and
- The potential impact of the project on advancing the state-of-the-art, and
- The potential of the proposed technology or solution to have broad applicability to the wind industry as a whole, including compatibility with turbines made by more than one manufacturer.

Criterion 2: Project Research and Market Transformation Plan (30%)

Research Approach, Workplan and SOPO

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals.
- The degree of rigor demonstrated in the research plan for testing and demonstrating the effectiveness of the proposed solution;
- Degree to which the applicants demonstrate that they have relevant permits sufficient to conduct research or have a credible plan to obtain them in a timeframe that will not cause significant project delays; and
- Plan for publication of research results in peer-reviewed literature in an expeditious fashion.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and
- Comprehensiveness of market transformation plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data management plan, U.S. manufacturing plan (Topic Areas 2 and 3 only) etc., and product distribution.

Criterion 3: Team and Resources (20%)

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

Criteria for Replies to Reviewer Comments

EERE has not established separate criteria to evaluate Replies to Reviewer Comments. Instead, Replies to Reviewer Comments are attached to the original applications and evaluated as an extension of the Full Application.

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA, by the standards set forth in EERE's Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011) and the guidance provided in the "Department of Energy Merit Review Guide for Financial Assistance," which is available at: https://energy.gov/management/downloads/merit-review-guide-financial-assistance-and-unsolicited-proposals-current.

C. Other Selection Factors

Program Policy Factors

In addition to the above criteria, the Selection Official may consider the following program policy factors in determining which Full Applications to select for award negotiations:

- The degree to which the proposed project exhibits technological or research diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers;
- The degree to which the proposed project is likely to lead to increased employment and manufacturing in the United States; and
- The degree to which the proposed project will accelerate transformational technological or scientific advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty.
- The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications).

D. Evaluation and Selection Process

Overview

The evaluation process consists of multiple phases; each includes an initial eligibility review and a thorough technical review. Rigorous technical reviews of eligible submissions are conducted by reviewers that are experts in the subject matter of the FOA. Ultimately, the Selection Official considers the recommendations of the reviewers, along with other considerations such as program policy factors, in determining which applications to select.

Pre-Selection Interviews

As part of the evaluation and selection process, EERE may invite one or more applicants to participate in Pre-Selection Interviews. Pre-Selection Interviews are distinct from and more formal than pre-selection clarifications (See

Section V.D.3 of the FOA). The invited applicant(s) will meet with EERE representatives to provide clarification on the contents of the Full Applications and to provide EERE an opportunity to ask questions regarding the proposed project. The information provided by applicants to EERE through Pre-Selection Interviews contributes to EERE's selection decisions.

EERE will arrange to meet with the invited applicants in person at EERE's offices or a mutually agreed upon location. EERE may also arrange site visits at certain applicants' facilities. In the alternative, EERE may invite certain applicants to participate in a one-on-one conference with EERE via webinar, videoconference, or conference call.

EERE will not reimburse applicants for travel and other expenses relating to the Pre-Selection Interviews, nor will these costs be eligible for reimbursement as pre-award costs.

EERE may obtain additional information through Pre-Selection Interviews that will be used to make a final selection determination. EERE may select applications for funding and make awards without Pre-Selection Interviews. Participation in Pre-Selection Interviews with EERE does not signify that applicants have been selected for award negotiations.

Pre-Selection Clarification

EERE may determine that pre-selection clarifications are necessary from one or more applicants. Pre-selection clarifications are distinct from and less formal than pre-selection interviews. These pre-selection clarifications will solely be for the purposes of clarifying the application, and will be limited to information already provided in the application documentation. The pre-selection clarifications may occur before, during or after the merit review evaluation process. Information provided by an applicant that is not necessary to address the pre-selection clarification question will not be reviewed or considered. Typically, a pre-selection clarification will be carried out through either written responses to EERE's written clarification questions or video or conference calls with EERE representatives.

The information provided by applicants to EERE through pre-selection clarifications is incorporated in their applications and contributes to the merit review evaluation and EERE's selection decisions. If EERE contacts an applicant for pre-selection clarification purposes, it does not signify that the applicant has been selected for negotiation of award or that the applicant is among the top ranked applications.

EERE will not reimburse applicants for expenses relating to the pre-selection clarifications, nor will these costs be eligible for reimbursement as pre-award costs.

Recipient Integrity and Performance Matters

DOE, prior to making a Federal award with a total amount of Federal share greater than the simplified acquisition threshold, is required to review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (currently FAPIIS) (see 41 U.S.C. 2313).

The applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a Federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM.

DOE will consider any written comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under Federal awards when completing the review of risk posed by applicants as described in 2 C.F.R. § 200.205.

Selection

The Selection Official may consider the technical merit, the Federal Consensus Board's recommendations, program policy factors, and the amount of funds available in arriving at selections for this FOA.

E. Anticipated Notice of Selection and Award Dates

EERE anticipates notifying applicants selected for negotiation of award by Winter 2018 and making awards by Spring 2019.

VI. Award Administration Information

A. Award Notices

Ineligible Submissions

Ineligible Concept Papers and Full Applications will not be further reviewed or considered for award. The Contracting Officer will send a notification letter by email to the technical and administrative points of contact

designated by the applicant in EERE Exchange. The notification letter will state the basis upon which the Concept Paper or the Full Application is ineligible and not considered for further review.

Concept Paper Notifications

EERE will notify applicants of its determination to encourage or discourage the submission of a Full Application. EERE will post these notifications to EERE Exchange.

Applicants may submit a Full Application even if they receive a notification discouraging them from doing so. By discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project. Such assessments do not necessarily reflect judgments on the merits of the proposed project. The purpose of the Concept Paper phase is to save applicants the considerable time and expense of preparing a Full Application that is unlikely to be selected for award negotiations.

A notification encouraging the submission of a Full Application does not authorize the applicant to commence performance of the project. Please refer to Section IV.J.2 of the FOA for guidance on pre-award costs.

Full Application Notifications

EERE will notify applicants of its determination via a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE Exchange. The notification letter will inform the applicant whether or not its Full Application was selected for award negotiations. Alternatively, EERE may notify one or more applicants that a final selection determination on particular Full Applications will be made at a later date, subject to the availability of funds or other factors.

Successful Applicants

Receipt of a notification letter selecting a Full Application for award negotiations does not authorize the applicant to commence performance of the project. If an application is selected for award negotiations, it is not a commitment by EERE to issue an award. Applicants do not receive an award until award negotiations are complete and the Contracting Officer executes the funding agreement, accessible by the Prime Recipient in FedConnect.

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. The

applicant must be responsive during award negotiations (i.e., provide requested documentation) and meet the negotiation deadlines. If the applicant fails to do so or if award negotiations are otherwise unsuccessful, EERE will cancel the award negotiations and rescind the Selection. EERE reserves the right to terminate award negotiations at any time for any reason.

Please refer to Section IV.J.2 of the FOA for guidance on pre-award costs.

Alternate Selection Determinations

In some instances, an applicant may receive a notification that its application was not selected for award and EERE designated the application to be an alternate. As an alternate, EERE may consider the Full Application for Federal funding in the future. A notification letter stating the Full Application is designated as an alternate does not authorize the applicant to commence performance of the project. EERE may ultimately determine to select or not select the Full Application for award negotiations.

Unsuccessful Applicants

EERE shall promptly notify in writing each applicant whose application has not been selected for award or whose application cannot be funded because of the unavailability of appropriated funds.

B. Administrative and National Policy Requirements

Registration Requirements

There are several one-time actions before submitting an application in response to this FOA, and it is vital that applicants address these items as soon as possible. Some may take several weeks, and failure to complete them could interfere with an applicant's ability to apply to this FOA, or to meet the negotiation deadlines and receive an award if the application is selected. These requirements are as follows:

1. **EERE Exchange**
   Register and create an account on EERE Exchange at https://eere-Exchange.energy.gov.
   This account will then allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Applicants should also designate backup points of contact so they may be easily

contacted if deemed necessary. **This step is required to apply to this FOA.**

The EERE Exchange registration does not have a delay; however, **the remaining registration requirements below could take several weeks to process and are necessary for a potential applicant to receive an award under this FOA**.

2. **DUNS Number**
   Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform.

3. **System for Award Management**
   Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.

4. **FedConnect**
   Register in FedConnect at https://www.fedconnect.net. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf.

5. **Grants.gov**
   Register in Grants.gov (http://www.grants.gov) to receive automatic updates when Amendments to this FOA are posted. However, please note that Concept Papers, and Full Applications will not be accepted through Grants.gov.

6. **Electronic Authorization of Applications and Award Documents**
   Submission of an application and supplemental information under this FOA through electronic systems used by the Department of Energy, including EERE Exchange and FedConnect.net, constitutes the authorized representative's approval and electronic signature.

Award Administrative Requirements

The administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR Part 200 as amended by 2 CFR Part 910.

Foreign National Access to DOE Sites

All applicants that ultimately enter into an award resulting from this FOA will be subject to the following requirement concerning foreign national involvement. Upon DOE's request, Prime Recipients must provide information to facilitate DOE's responsibilities associated with foreign national access to DOE sites, information, technologies, and equipment. A foreign national is defined as any person who was born outside the jurisdiction of the United States, is a citizen of a foreign government, and has not been naturalized under U.S. law. If the Prime Recipient or Subrecipients, contractors or vendors under the award, anticipate utilizing a foreign national person in the performance of an award, the Prime Recipient is responsible for providing to the Contracting Officer specific information of the foreign national(s) to satisfy compliance with all of the requirements for access approval.

Subaward and Executive Reporting

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency Act of 2006 (FFATA) are contained in 2 CFR Part 170. Prime Recipients must register with the new FFATA Subaward Reporting System database and report the required data on their first tier Subrecipients. Prime Recipients must report the executive compensation for their own executives as part of their registration profile in SAM.

National Policy Requirements

The National Policy Assurances that are incorporated as a term and condition of award are located at: http://www.nsf.gov/awards/managing/rtc.jsp.

Environmental Review in Accordance with National Environmental Policy Act (NEPA)

EERE's decision whether and how to distribute federal funds under this FOA is subject to the National Environmental Policy Act (42 USC 4321, *et seq.*). NEPA requires Federal agencies to integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE's NEPA website, at http://nepa.energy.gov/.

While NEPA compliance is a Federal agency responsibility and the ultimate decisions remain with the Federal agency, all recipients selected for an award will be required to assist in the timely and effective completion of the NEPA process in the manner most pertinent to their proposed project. If DOE determines certain records must be prepared to complete the NEPA review process (e.g., biological evaluations or environmental assessments), the costs to prepare the necessary records may be included as part of the project costs.

Applicant Representations and Certifications

1. **Lobbying Restrictions**
   By accepting funds under this award, the Prime Recipient agrees that none of the funds obligated on the award shall be expended, directly or indirectly, to influence Congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. §1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

2. **Corporate Felony Conviction and Federal Tax Liability Representations**
   In submitting an application in response to this FOA, the applicant represents that:

   a. It is **not** a corporation that has been convicted of a felony criminal violation under any Federal law within the preceding 24 months, and
   b. It is **not** a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

   For purposes of these representations the following definitions apply:

   A Corporation includes any entity that has filed articles of incorporation in any of the 50 states, the District of Columbia, or the various territories of the United States [but not foreign corporations]. It includes both for-profit and non-profit organizations.

3. **Nondisclosure and Confidentiality Agreements Representations**

In submitting an application in response to this FOA the applicant represents that:

a. It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contactors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

b. It **does not and will not** use any Federal funds to implement or enforce any nondisclosure and/or confidentiality policy, form, or agreement it uses unless it contains the following provisions:

(1) *"These provisions are consistent with and do not supersede, conflict with, or otherwise alter the employee obligations, rights, or liabilities created by existing statute or Executive order relating to (1) classified information, (2) communications to Congress, (3) the reporting to an Inspector General of a violation of any law, rule, or regulation, or mismanagement, a gross waste of funds, an abuse of authority, or a substantial and specific danger to public health or safety, or (4) any other whistleblower protection. The definitions, requirements, obligations, rights, sanctions, and liabilities created by controlling Executive orders and statutory provisions are incorporated into this agreement and are controlling."*

(2) The limitation above shall not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(3) Notwithstanding the provision listed in paragraph (a), a nondisclosure or confidentiality policy form or agreement that is to be executed by a person connected with the conduct of an intelligence or intelligence-related activity,

other than an employee or officer of the United States Government, may contain provisions appropriate to the particular activity for which such document is to be used. Such form or agreement shall, at a minimum, require that the person will not disclose any classified information received in the course of such activity unless specifically authorized to do so by the United States Government. Such nondisclosure or confidentiality forms shall also make it clear that they do not bar disclosures to Congress, or to an authorized official of an executive agency or the Department of Justice, that are essential to reporting a substantial violation of law.

Statement of Federal Stewardship

EERE will exercise normal Federal stewardship in overseeing the project activities performed under EERE Awards. Stewardship Activities include, but are not limited to, conducting site visits; reviewing performance and financial reports, providing assistance and/or temporary intervention in usual circumstances to correct deficiencies that develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the project objectives have been accomplished.

Statement of Substantial Involvement

EERE has substantial involvement in work performed under Awards made as a result of this FOA. EERE does not limit its involvement to the administrative requirements of the Award. Instead, EERE has substantial involvement in the direction and redirection of the technical aspects of the project as a whole. Substantial involvement includes, but is not limited to, the following:

1. EERE shares responsibility with the recipient for the management, control, direction, and performance of the Project.

2. EERE may intervene in the conduct or performance of work under this Award for programmatic reasons. Intervention includes the interruption or modification of the conduct or performance of project activities.

3. EERE may redirect or discontinue funding the Project based on the outcome of EERE's evaluation of the Project at that the Go/No Go decision point(s).

4. EERE participates in major project decision-making processes.

Intellectual Property Management Plan

If requested by the Contracting Officer, applicants with at least one other team member must submit an executed IP Management Plan between the members of the consortia or team as a first quarter milestone, which will be set forth in the Statement of Project Objectives.

The award will set forth the treatment of and obligations related to intellectual property rights between EERE and the individual members. The IP Management Plan should describe how the members will handle intellectual property rights and issues between themselves while ensuring compliance with Federal IP laws, regulations, and policies (see Sections VIII.L-VIII.O of this FOA for more details on applicable Federal IP laws and regulations). Guidance regarding the contents of IP Management Plans is available from EERE upon request.

The following is a non-exhaustive list of examples of items that the IP Management Plan may cover:

- The treatment of confidential information between members (i.e., the use of non-disclosure agreements);
- The treatment of background IP (e.g., any requirements for identifying it or making it available);
- The treatment of inventions made under the project (e.g., any requirements for disclosing to the other members, filing patent applications, paying for patent prosecution, and cross-licensing or other licensing arrangements between the members);
- The treatment of data produced, including software, under the project (e.g., any publication process or other dissemination strategies, copyrighting strategy or arrangement between members);
- Any technology transfer and commercialization requirements or arrangements between the members;
- The treatment of any intellectual property issues that may arise due to a change in membership of the consortia or team; and
- The handling of disputes related to intellectual property between the members.

Subject Invention Utilization Reporting

In order to ensure that Prime Recipients and Subrecipients holding title to subject inventions are taking the appropriate steps to commercialize subject inventions, EERE may require that each Prime Recipient holding title to a subject invention submit annual reports for 10 years from the date the subject invention was disclosed to EERE on the utilization of the subject invention and efforts made by Prime Recipient or their licensees or assignees to stimulate such utilization. The reports must include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Prime Recipient, and such other data and information as EERE may specify.

Intellectual Property Provisions

The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at http://www1.eere.energy.gov/financing/resources.html.

Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement. The checklist can be accessed at http://www1.eere.energy.gov/financing/resources.html.

Go/No-Go Review

Each project selected under this FOA will be subject to a periodic project evaluation referred to as a Go/No-Go Review. Federal funding beyond the Go/No Go decision point (continuation funding), is contingent on (1) the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) meeting the objectives, milestones, deliverables, and decision point criteria of recipient's approved project and obtaining approval from EERE to continue work on the project; and (3) the submittal of required reports in accordance with the Statement of Project Objectives.

As a result of the Go/No Go Review, DOE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

The Go/No-Go decision is distinct from a non-compliance determination. In the event a recipient fails to comply with the requirements of an award, EERE may take appropriate action, including but not limited to, redirecting, suspending or terminating the award.

Conference Spending

The recipient shall not expend any funds on a conference not directly and programmatically related to the purpose for which the grant or cooperative agreement was awarded that would defray the cost to the United States Government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States Government would otherwise exceed $20,000, thereby circumventing the required notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

UCC Financing Statements

Per 2 CFR 910.360 (Real Property and Equipment) when a piece of equipment is purchased by a for-profit recipient or subrecipient with Federal Funds, and when the Federal share of the financial assistance agreement is more than $1,000,000, the recipient or subrecipient must:

Properly record, and consent to the Department's ability to properly record if the recipient fails to do so, UCC financing statement(s) for all equipment in excess of $5,000 purchased with project funds. These financing statement(s) must be approved in writing by the contracting officer prior to the recording, and they shall provide notice that the Recipient's title to all equipment (not real property) purchased with Federal funds under the financial assistance agreement is conditional pursuant to the terms of this section, and that the Government retains an undivided reversionary interest in the equipment. The UCC financing statement(s) must be filed before the Contracting Officer may reimburse the recipient for the Federal share of the equipment unless otherwise provided for in the relevant financial assistance agreement. The recipient shall further make any amendments to the financing statements or additional recordings, including appropriate continuation statements, as necessary or as the contracting officer may direct.

VII. Questions/Agency Contacts

Questions about this FOA? Email WindFarmFOA@ee.doe.gov.
Problems with EERE Exchange? Email EERE- EERE-ExchangeSupport@hq.doe.gov Include FOA name and number in subject line.

Upon the issuance of a FOA, EERE personnel are prohibited from communicating (in writing or otherwise) with applicants regarding the FOA except through the established question and answer process as described below. Specifically, questions regarding the content of this FOA must be submitted to: WindFarmFOA@ee.doe.gov. Questions must be submitted not later than 3 business days prior to the application due date and time.

All questions and answers related to this FOA will be posted on EERE Exchange at: https://eere-exchange.energy.gov. **Please note that you must first select this specific FOA Number in order to view the questions and answers specific to this FOA.** EERE will attempt to respond to a question within 3 business days, unless a similar question and answer has already been posted on the website.

Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov.

VIII. Other Information

A. FOA Modifications

Amendments to this FOA will be posted on the EERE Exchange website and the Grants.gov system. However, you will only receive an email when an amendment or a FOA is posted on these sites if you register for email notifications for this FOA in Grants.gov. EERE recommends that you register as soon after the release of the FOA as possible to ensure you receive timely notice of any amendments or other FOAs.

B. Government Right to Reject or Negotiate

EERE reserves the right, without qualification, to reject any or all applications received in response to this FOA and to select any application, in whole or in part, as a basis for negotiation and/or award.

C. Commitment of Public Funds

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by anyone other than the Contracting Officer, either express or implied, is invalid.

D. Treatment of Application Information

In general, EERE will only use data and other information contained in applications for evaluation purposes, unless such information is generally available to the public or is already the property of the Government.

Applicants should not include trade secrets or commercial or financial information that is privileged or confidential in their application unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the FOA.

The use of protective markings such as "Do Not Publicly Release – Trade Secret" or "Do Not Publicly Release – Confidential Business Information" is encouraged. However, applicants should be aware that the use of protective markings is not dispositive as to whether information will be publicly released pursuant to the Freedom of Information Act, 5 U.S.C. §552, et. seq., as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175. (See Section I of this document, "Notice of Potential Disclosure Under the Freedom of Information Act (FOIA)" for additional information regarding the public release of information under the Freedom of Information Act.

Applicants are encouraged to employ protective markings in the following manner:

The cover sheet of the application must be marked as follows and identify the specific pages containing trade secrets or commercial or financial information that is privileged or confidential:

> Notice of Restriction on Disclosure and Use of Data:
> Pages [list applicable pages] of this document may contain trade secrets or commercial or financial information that is privileged or confidential, and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.
> [End of Notice]

The header and footer of every page that contains trade secrets or commercial or financial information that is privileged must be marked as follows: "May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure."

In addition, each line or paragraph containing trade secrets or commercial or financial information that is privileged or confidential must be enclosed in brackets.

E. Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation, the Go/No-Go Review and Peer Review, the Government may seek the advice of qualified non Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

F. Notice Regarding Eligible/Ineligible Activities

Eligible activities under this FOA include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

G. Notice of Right to Conduct a Review of Financial Capability

EERE reserves the right to conduct an independent third party review of financial capability for applicants that are selected for negotiation of award (including personal credit information of principal(s) of a small business if there is insufficient information to determine financial capability of the organization).

H. Notice of Potential Disclosure Under Freedom of Information Act (FOIA)

Under the Freedom of Information Act, (FOIA), 5 U.S.C. §552, et. seq., as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175, any information received from the Applicant is considered to be an agency record, and as such, subject to public release under FOIA. The purpose of the FOIA is to afford the public the right to request and receive agency records unless those agency records are protected from disclosure under one or more of the nine FOIA exemptions. Decisions to disclose or withhold information received from the Applicant are based upon the applicability of one or more of the nine FOIA exemptions, not on the existence or nonexistence of protective markings or designations. Only the agency's designated FOIA Officer may determine if information received from the Applicant may be withheld pursuant to one of the nine FOIA exemptions. All FOIA requests received by DOE are processed in accordance with 10 C.F.R. Part 1004.

I. Requirement for Full and Complete Disclosure

Applicants are required to make a full and complete disclosure of all information requested. Any failure to make a full and complete disclosure of the requested information may result in:

- The termination of award negotiations;
- The modification, suspension, and/or termination of a funding agreement;
- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of Federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

J. Retention of Submissions

EERE expects to retain copies of all Concept Papers, Full Applications, Replies to Reviewer Comments, and other submissions. No submissions will be returned. By applying to EERE for funding, applicants consent to EERE's retention of their submissions.

K. Title to Subject Inventions

Ownership of subject inventions is governed pursuant to the authorities listed below.

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions.
- All other parties: The Federal Non-Nuclear Energy Act of 1974, 42. U.S.C. 5908, provides that the Government obtains title to new inventions unless a waiver is granted (see below).
- Class Patent Waiver:

DOE has issued a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan (Topic Areas 2 and 3 only) are sufficient.

- Advance and Identified Waivers: Applicants may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to EERE within the timeframes set forth in the award's intellectual property terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784.
- Determination of Exceptional Circumstances (DEC): For Topic Area 2 and 3, each applicant is required to submit a U.S. Manufacturing Plan as part of its application. If selected, the U.S. Manufacturing Plan shall be incorporated into the award terms and conditions for domestic small businesses and nonprofit organizations. DOE has determined that exceptional circumstances exist that warrants the modification of the standard patent rights clause for small businesses and non-profit awardees under Bayh-Dole to the extent necessary to implement and enforce the U.S. Manufacturing Plan. For example, the commitments and enforcement of a U.S. Manufacturing Plan may be tied to subject inventions. Any Bayh-Dole entity (domestic small business or nonprofit organization) affected by this DEC has the right to appeal it.

L. Government Rights in Subject Inventions

Where Prime Recipients and Subrecipients retain title to subject inventions, the U.S. Government retains certain rights.

Government Use License

The U.S. Government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world. This license extends to contractors doing work on behalf of the Government.

March-In Rights

The U.S. Government retains march-in rights with respect to all subject inventions. Through "march-in rights," the Government may require a Prime Recipient or Subrecipient who has elected to retain title to a subject invention (or their assignees or exclusive licensees), to grant a license for use of the invention to a third party. In addition, the Government may grant licenses for use of the subject invention when a Prime Recipient, Subrecipient, or their assignees and exclusive licensees refuse to do so.

DOE may exercise its march-in rights only if it determines that such action is necessary under any of the four following conditions:

- The owner or licensee has not taken or is not expected to take effective steps to achieve practical application of the invention within a reasonable time;
- The owner or licensee has not taken action to alleviate health or safety needs in a reasonably satisfied manner;
- The owner has not met public use requirements specified by Federal statutes in a reasonably satisfied manner; or
- The U.S. Manufacturing requirement has not been met.

Any determination that march-in rights are warranted must follow a fact-finding process in which the recipient has certain rights to present evidence and witnesses, confront witnesses and appear with counsel and appeal any adverse decision. To date, DOE has never exercised its march-in rights to any subject inventions.

M. Rights in Technical Data

Data rights differ based on whether data is first produced under an award or instead was developed at private expense outside the award.

"Limited Rights Data": The U.S. Government will not normally require delivery of confidential or trade secret-type technical data developed solely at private expense prior to issuance of an award, except as necessary to monitor technical progress and evaluate the potential of proposed technologies to reach specific technical and cost metrics.

Government rights in Technical Data Produced Under Awards: The U.S. Government normally retains unlimited rights in technical data produced under Government financial assistance awards, including the right to distribute to the public. However, pursuant to special statutory authority, certain categories of data generated under EERE awards may be protected from public disclosure for up to five years after the data is generated ("Protected Data"). For awards permitting Protected Data, the protected data must be marked as set forth in the awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

N. Copyright

The Prime Recipient and Subrecipients may assert copyright in copyrightable works, such as software, first produced under the award without EERE approval. When copyright is asserted, the Government retains a paid-up nonexclusive, irrevocable worldwide license to reproduce, prepare derivative works, distribute copies to the public, and to perform publicly and display publicly the copyrighted work. This license extends to contractors and others doing work on behalf of the Government.

O. Personally Identifiable Information (PII)

All information provided by the Applicant must to the greatest extent possible exclude Personally Identifiable Information (PII). The term "personally identifiable information" refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, etc. alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name, etc. (See OMB Memorandum M-07-16 dated May 22, 2007, found at: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2007/m07-16.pdf

By way of example, Applicants must screen resumes to ensure that they do not contain PII such as personal addresses, phone/cell numbers, personal emails and/or SSNs. In short, if the PII is not essential to the application, it should not be in the application.

P. Annual Independent Audits

If a for-profit entity is a Prime Recipient and has expended $750,000 or more of DOE awards during the entity's fiscal year, an annual Compliance Audit performed by an independent auditor is required. For additional information, please refer to 2 C.F.R. § 910.501 and Subpart F.

If an educational institution, non-profit organization, or state/local government is a Prime Recipient or Subrecipient and has expended $750,000 or more of Federal awards during the non-Federal entity's fiscal year, then a Single or Program-Specific Audit is required. For additional information, please refer to 2 C.F.R. § 200.501 and Subpart F.

Applicants and sub-recipients (if applicable) should propose sufficient costs in the project budget to cover the costs associated with the audit. EERE will share in the cost of the audit at its applicable cost share ratio.

Appendix A – Cost Share Information

Cost Sharing or Cost Matching

The terms "cost sharing" and "cost matching" are often used synonymously. Even the DOE Financial Assistance Regulations, 2 CFR 200.306, use both of the terms in the titles specific to regulations applicable to cost sharing. EERE almost always uses the term "cost sharing," as it conveys the concept that non-federal share is calculated as a percentage of the Total Project Cost. An exception is the State Energy Program Regulation, 10 CFR 420.12, State Matching Contribution. Here "cost matching" for the non-federal share is calculated as a percentage of the Federal funds only, rather than the Total Project Cost.

How Cost Sharing Is Calculated

As stated above, cost sharing is calculated as a percentage of the Total Project Cost. FFRDC costs must be included in Total Project Costs. Following is an example of how to calculate cost sharing amounts for a project with $1,000,000 in federal funds with a minimum 20% non-federal cost sharing requirement:

- Formula: Federal share ($) divided by Federal share (%) = Total Project Cost
  Example: $1,000,000 divided by 80% = $1,250,000

- Formula: Total Project Cost ($) minus Federal share ($) = Non-federal share ($)
  Example: $1,250,000 minus $1,000,000 = $250,000

- Formula: Non-federal share ($) divided by Total Project Cost ($) = Non-federal share (%)
  Example: $250,000 divided by $1,250,000 = 20%

What Qualifies For Cost Sharing

While it is not possible to explain what specifically qualifies for cost sharing in one or even a couple of sentences, in general, if a cost is allowable under the cost principles applicable to the organization incurring the cost and is eligible for reimbursement under an EERE grant or cooperative agreement, then it is allowable as cost share. Conversely, if the cost is not allowable under the cost principles and not eligible for reimbursement, then it is not allowable as cost share. In addition, costs may not be counted as cost share if they are paid by the Federal Government under another award unless authorized by Federal statute to be used for cost sharing.

The rules associated with what is allowable as cost share are specific to the type of organization that is receiving funds under the grant or cooperative agreement, though are generally the same for all types of entities. The specific rules applicable to:

- FAR Part 31 for For-Profit entities, (48 CFR Part 31); and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

In addition to the regulations referenced above, other factors may also come into play such as timing of donations and length of the project period. For example, the value of ten years of donated maintenance on a project that has a project period of five years would not be fully allowable as cost share. Only the value for the five years of donated maintenance that corresponds to the project period is allowable and may be counted as cost share.

Additionally, EERE generally does not allow pre-award costs for either cost share or reimbursement when these costs precede the signing of the appropriation bill that funds the award. In the case of a competitive award, EERE generally does not allow pre-award costs prior to the signing of the Selection Statement by the EERE Selection Official.

General Cost Sharing Rules on a DOE award

1. Cash Cost Share - encompasses all contributions to the project made by the recipient or subrecipeint(s), for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment, etc. for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project.

2. In Kind Cost Share - encompasses all contributions to the project made by the recipient or subrecipient(s) that do not involve a payment or reimbursement and represent donated items or services. In Kind cost share items include volunteer personnel hours, donated existing equipment, donated existing supplies, etc. The cash value and calculations thereof for all In Kind cost share items must be justified and explained in the Cost Share section of the project Budget Justification (EERE 335). All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out the In Kind cost share section of the Budget Justification (EERE 335).

3. Funds from other Federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC sub-recipients. Non-Federal sources include any source not originally derived from Federal funds. Cost sharing commitment letters from subrecipients must be provided with the original application.

4. Fee or profit, including foregone fee or profit, are not allowable as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

DOE Financial Assistance Rules 2 CFR Part 200 as amended by 2 CFR Part 910

As stated above, the rules associated with what is allowable cost share are generally the same for all types of organizations. Following are the rules found to be common, but again, the specifics are contained in the regulations and cost principles specific to the type of entity:

(A) Acceptable contributions. All contributions, including cash contributions and third party in-kind contributions, must be accepted as part of the Prime Recipient's cost sharing if such contributions meet all of the following criteria:

(1) They are verifiable from the recipient's records.

(2) They are not included as contributions for any other federally-assisted project or program.

(3) They are necessary and reasonable for the proper and efficient accomplishment of project or program objectives.

(4) They are allowable under the cost principles applicable to the type of entity incurring the cost as follows:

a. For-profit organizations. Allowability of costs incurred by for-profit organizations and those nonprofit organizations listed in Attachment C to OMB Circular A–122 is determined in accordance with the for-profit cost principles in 48 CFR Part 31 in the Federal Acquisition Regulation, except that patent prosecution costs are not allowable unless specifically authorized in the award document. (v) Commercial Organizations. FAR Subpart 31.2—Contracts with Commercial Organizations

b. Other types of organizations. For all other non-federal entities, allowability of costs is determined in accordance with 2 CFR Part 200 Subpart E.

(5) They are not paid by the Federal Government under another award unless authorized by Federal statute to be used for cost sharing or matching.

(6) They are provided for in the approved budget.

(B) Valuing and documenting contributions

(1) Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that amounts chargeable to the project are determined on the basis of costs incurred. For real property or equipment used on the project, the cost principles authorize depreciation or use charges. The full value of the item may be applied when the item will be consumed in the performance of the award or fully depreciated by the end of the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

a. The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or
b. The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.

(2) Valuing services of others' employees. If an employer other than the recipient furnishes the services of an employee, those services are valued at the employee's regular rate of pay, provided these services are for the same skill level for which the employee is normally paid.

(3) Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as cost sharing or matching if the service is an integral and necessary part of an approved project or program. Rates for volunteer services must be consistent with those paid for similar work in the recipient's organization. In those markets in which the required skills are not found in the recipient organization, rates must be consistent with those paid for similar work in the labor market in which the recipient competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.

(4) Valuing property donated by third parties.

a. Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the cost sharing or matching share must be reasonable and must not exceed the fair market value of the property at the time of the donation.

b. Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:

   i. The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of comparable space and facilities in a privately-owned building in the same locality.
   ii. The value of loaned equipment must not exceed its fair rental value.

(5) Documentation. The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:

a. Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.

b. The basis for determining the valuation for personal services and property must be documented.

Appendix B – Sample Cost Share Calculation for Blended Cost Share Percentage

The following example shows the math for calculating required cost share for a project with $2,000,000 in Federal funds with four tasks requiring different Non-federal cost share percentages:

Task	Proposed Federal Share	Federal Share %	Recipient Share %
Task 1 (R&D)	$1,000,000	80%	20%
Task 2 (R&D)	$500,000	80%	20%
Task 3 (Demonstration)	$400,000	50%	50%
Task 4 (Outreach)	$100,000	100%	0%

Federal share ($) divided by Federal share (%) = Task Cost

Each task must be calculated individually as follows:

Task 1
$1,000,000 divided by 80% = $1,250,000 (Task 1 Cost)
Task 1 Cost minus federal share = Non-federal share
$1,250,000 - $1,000,000 = $250,000 (Non-federal share)

Task 2
$500,000 divided 80% = $625,000 (Task 2 Cost)
Task 2 Cost minus federal share = Non-federal share
$625,000 - $500,000 = $125,000 (Non-federal share)

Task 3
$400,000 / 50% = $800,000 (Task 3 Cost)
Task 3 Cost minus federal share = Non-federal share
$800,000 - $400,000 = $400,000 (Non-federal share)

Task 4
Federal share = $100,000
Non-federal cost share is not mandated for outreach = $0 (Non-federal share)

The calculation may then be completed as follows:

Tasks	$ Federal Share	% Federal Share	$ Non-Federal Share	% Non-Federal Share	Total Project Cost
Task 1	$1,000,000	80%	$250,000	20%	$1,250,000
Task 2	$500,000	80%	$125,000	20%	$625,000
Task 3	$400,000	50%	$400,000	50%	$800,000
Task 4	$100,000	100%	$0	0%	$100,000
Totals	$2,000,000		$775,000		$2,775,000

Blended Cost Share %
Non-federal share ($775,000) divided by Total Project Cost ($2,775,000) = 27.9% (Non-federal)
Federal share ($2,000,000) divided by Total Project Cost ($2,775,000) = 72.1% (Federal)

Appendix C – Waiver Requests: Foreign Entity Participation as the Prime Recipient and Performance of Work in the United States

1. Waiver for Foreign Entity Participation as the Prime Recipient

As set forth in Section III.A.3, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

Overall, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the Prime Recipient. A request to waive the *Foreign Entity Participation as the Prime Recipient* requirement must include the following:

- Entity name;
- The rationale for proposing a foreign entity to serve as the Prime Recipient;
- Country of incorporation;
- A description of the project's anticipated contributions to the US economy;
    - How the project will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
    - How the project will promote domestic American manufacturing of products and/or services;
- A description of how the foreign entity's participation as the Prime Recipient is essential to the project;
- A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP;
- Countries where the work will be performed (Note: if any work is proposed to be conducted outside the U.S., the applicant must also complete a separate request for waiver of the Performance of Work in the United States requirement).

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE's decision concerning a waiver request.

2. Waiver for Performance of Work in the United States

As set forth in Section IV.J.3, all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a

waiver is not required for foreign purchases of these items. However, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

Overall, a waiver request must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to perform work outside of the United States. A request to waive the *Performance of Work in the United States* requirement must include the following:

- The rationale for performing the work outside the U.S. ("foreign work");
- A description of the work proposed to be performed outside the U.S.;
- An explanation as to how the foreign work is essential to the project;
- A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the US economy;
    - The associated benefits to be realized and the contribution to the project from the foreign work;
    - How the foreign work will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
    - How the foreign work will promote domestic American manufacturing of products and/or services;
- A description of the likelihood of Intellectual Property (IP) being created from the foreign work and the treatment of any such IP;
- The total estimated cost (DOE and Recipient cost share) of the proposed foreign work;
- The countries in which the foreign work is proposed to be performed; and
- The name of the entity that would perform the foreign work.

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE's decision concerning a waiver request.

Appendix D - Data Management Plan

A data management plan ("DMP") explains how data generated in the course of the work performed under an EERE award will be shared and preserved or, when justified, explains why data sharing or preservation is not possible or scientifically appropriate.

DMP Requirements

In order for a DMP to be considered acceptable, the DMP must address the following:

At a minimum, the DMP must describe how data sharing and preservation will enable validation of the results from the proposed work, or how results could be validated if data are not shared or preserved.

The DMP must provide a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publication. This includes data that are displayed in charts, figures, images, etc. In addition, the underlying digital research data used to generate the displayed data should be made as accessible as possible in accordance with the principles stated above. This requirement could be met by including the data as supplementary information to the published article, or through other means. The published article should indicate how these data can be accessed.

The DMP should consult and reference available information about data management resources to be used in the course of the proposed work. In particular, a DMP that explicitly or implicitly commits data management resources at a facility beyond what is conventionally made available to approved users should be accompanied by written approval from that facility. In determining the resources available for data management at DOE User Facilities, researchers should consult the published description of data management resources and practices at that facility and reference it in the DMP. Information about other DOE facilities can be found in the additional guidance from the sponsoring program.

The DMP must protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; avoid significant negative impact on innovation, and U.S. competitiveness; and otherwise be consistent with all laws (i.e., export control laws), and DOE regulations, orders, and policies.

Data Determination for a DMP

The Principal Investigator should determine which data should be the subject of the DMP and, in the DMP, propose which data should be shared and/or preserved in accordance with the DMP Requirements noted above.

For data that will be generated through the course of the proposed work, the Principal Investigator should indicate what types of data should be protected from immediate public disclosure by DOE (referred to as "protected data") and what types of data that DOE should be able to release immediately. Similarly, for data developed outside of the proposed work at private expense that will be used in the course of the proposed work, the Principal Investigator should indicate whether that type of data will be subject to public release or kept confidential (referred to as "limited rights data"). Any use of limited rights data or labeling of data as "protected data" must be consistent with the DMP Requirements noted above.

Suggested Elements for a DMP

The following list of elements for a DMP provides suggestions regarding the data management planning process and the structure of the DMP:

Data Types and Sources: A brief, high-level description of the data to be generated or used through the course of the proposed work and which of these are considered digital research data necessary to validate the research findings or results.

Content and Format: A statement of plans for data and metadata content and format including, where applicable, a description of documentation plans, annotation of relevant software, and the rationale for the selection of appropriate standards. Existing, accepted community standards should be used where possible. Where community standards are missing or inadequate, the DMP could propose alternate strategies for facilitating sharing, and should advise the sponsoring program of any need to develop or generalize standards.

Sharing and Preservation: A description of the plans for data sharing and preservation. This should include, when appropriate: the anticipated means for sharing and the rationale for any restrictions on who may access the data and under what conditions; a timeline for sharing and preservation that addresses both the minimum length of time the data will be available and any anticipated delay to data access after research findings are published; any special requirements for data sharing, for example, proprietary software needed to access or interpret data, applicable policies, provisions, and licenses for re-use and re-distribution, and for the production of derivatives, including guidance for how data and data products should be cited; any resources and capabilities (equipment, connections,

systems, software, expertise, etc.) requested in the research proposal that are needed to meet the stated goals for sharing and preservation (this could reference the relevant section of the associated research proposal and budget request); and whether/where the data will be preserved after direct project funding ends and any plans for the transfer of responsibilities for sharing and preservation.

Protection: A statement of plans, where appropriate and necessary, to protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; and avoid significant negative impact on innovation, and U.S. competitiveness.

Rationale: A discussion of the rationale or justification for the proposed data management plan including, for example, the potential impact of the data within the immediate field and in other fields, and any broader societal impact.

Additional Guidance

In determining which data should be shared and preserved, researchers must consider the data needed to validate research findings as described in the Requirements, and are encouraged to consider the potential benefits of their data to their own fields of research, fields other than their own, and society at large.

DMPs should reflect relevant standards and community best practices and make use of community accepted repositories whenever practicable.

Costs associated with the scope of work and resources articulated in a DMP may be included in the proposed research budget as permitted by the applicable cost principles.

To improve the discoverability of and attribution for datasets created and used in the course of research, EERE encourages the citation of publicly available datasets within the reference section of publications, and the identification of datasets with persistent identifiers such as Digital Object Identifiers (DOIs). In most cases, EERE can provide DOIs free of charge for data resulting from DOE-funded research through its Office of Scientific and Technical Information (OSTI) DataID Service.

EERE's Digital Data Management principles can be found at: EERE Digital Data Management | Department of Energy

Definitions

Data Preservation: Data preservation means providing for the usability of data beyond the lifetime of the research activity that generated them.

Data Sharing: Data sharing means making data available to people other than those who have generated them. Examples of data sharing range from bilateral communications with colleagues, to providing free, unrestricted access to anyone through, for example, a web-based platform.

Digital Research Data: The term digital data encompasses a wide variety of information stored in digital form including: experimental, observational, and simulation data; codes, software and algorithms; text; numeric information; images; video; audio; and associated metadata. It also encompasses information in a variety of different forms including raw, processed, and analyzed data, published and archived data.

Research Data: The recorded factual material commonly accepted in the scientific community as necessary to validate research findings, but not any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, or communications with colleagues. This 'recorded' material excludes physical objects (e.g., laboratory samples). Research data also do not include:

> (A) Trade secrets, commercial information, materials necessary to be held confidential by a researcher until they are published, or similar information which is protected under law; and
>
> (B) Personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy, such as information that could be used to identify a particular person in a research study."

Validate: In the context of DMPs, validate means to support, corroborate, verify, or otherwise determine the legitimacy of the research findings. Validation of research findings could be accomplished by reproducing the original experiment or analyses; comparing and contrasting the results against those of a new experiment or analyses; or by some other means.

MERIT REVIEW ADVISORY REPORT

For

Funding Opportunity Announcement (FOA)
Number: DE-FOA-0001644

DEPARTMENT OF ENERGY (DOE)
OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY (EERE)
STATE ENERGY PROGRAM (SEP) 2017 COMPETITIVE AWARDS

TO: AnnaMaria Garcia
Director – Weatherization and Intergovernmental Programs
Selection Official

FROM: FOA Managers Charles T. Satterfield, II and Henry D. Fowler
Weatherization and Intergovernmental Programs

_____ _____

Henry D. Fowler, FOA Co-Manager Date

_____ _____

Charles T. Satterfield, FOA Co- Manager Date

TABLE OF CONTENTS

I. Overview

This Merit Review Advisory Report presents (1) a summary of the evaluation process and (2) the recommendation of the Federal Consensus Board (Board) to the Selection Official as to which applications should be considered for Selection (for award negotiations), which applications should be considered as Alternates, and the applications that are not recommended for further action. **NOTE:** All terminology used in this document (e.g., "Independent Reviewer," "eligibility," etc.) are used per the definitions provided in the EERE Standard Evaluation and Selection Plan.

Table 1. Applications the Board determined to be Technically Acceptable

Full Application Phase Summary	
Applications Received by EERE	23
Ineligible Full Applications	0
Eligible Full Applications	23
Applications Determined to be Technically Acceptable	18
Applications Determined to be Not Technically Acceptable	5
Applications Recommended for Selection for Award Negotiations	17
Applications Recommended as Alternates	1
Applications Not Recommended for Further Action	5
Date DOE sent Notice(s) of Ineligible Full Applications	N/A

II. Eligibility Review

The FOA Managers conducted an eligibility review for each of the Applications received. Each eligibility review was conducted in a manner consistent with the EERE Standard Evaluation and Selection Plan as modified by the deviations enumerated in the FOA Requirements Document (FRD) signed by Anna Garcia on 11/21/16 and Kathleen Hogan on 11/28/16. A complete list of deviations to the EERE Standard Evaluation and Selection Plan and associated rationales can be found in Section IV. Defaults and Deviations Table, pages 13-27 of the FRD.

Per the EERE Standard Evaluation and Selection Plan, the FOA Managers are to provide a recommendation to the Contracting Officer to reject any Application that the FOA Managers deem ineligible. The FOA Managers' recommendation includes a brief rationale to support the results of the eligibility review. The Contracting Officer, with concurrence from Legal Counsel, makes the final determination as to which applicant submissions are ineligible. The findings of the eligibility review are listed in Attachment 1, *Record of Initial Eligibility Review.*

The eligibility review did not identify any ineligible Applications. The details of each eligibility review is captured in Attachment 1.

III. Reviewers and Evaluation Process

A. CONFLICT OF INTEREST

All reviewers and other participants (e.g., EERE personnel participating in the process) in the evaluation and selection process had a current signed Conflict of Interest and Nondisclosure Acknowledgement (COI/NDA) form on file with EERE before they accessed the applicant submissions. Reviewers and other participants were instructed to immediately notify the FOA Managers of any circumstances that could create an apparent or actual COI. All COI/NDA forms are on file in Exchange.

The FOA Managers immediately consulted with Legal Counsel and the Contracting Officer regarding any actual or apparent COIs involving persons participating in the evaluation and selection process. Legal Counsel advised the FOA Managers and the Contracting Officer as to the appropriate strategy to mitigate or avoid the COI. The FOA Managers addressed all actual and apparent COIs in accordance with the EERE Standard Evaluation and Selection Plan, the advice of Legal Counsel, and with the concurrence of the Contracting Officer.

Table 3 identifies all COIs identified during the evaluation and selection process:

Table 3. COIs Identified

Reviewer	Organization	Conflict of Interest(s)	Mitigation Approach
Alice Dasek	DOE	Served as the Policy Advisor on an active SEP Competitive Award to New Hampshire.	The NH application was reassigned to another independent reviewer.

B. APPLICATION REVIEW PROCESS

i. Application Reviewers

The list of Independent Reviewers and Federal Consensus Board members is included in Attachment 2, *Merit Review Appointment Memorandum.*

ii. Independent Review Process for Full Applications

Each Full Application was assigned to no fewer than three Independent Reviewers in the EERE Exchange system. Reviewer training meetings were held via webinar on January 10th and 11th, 2018. The webinars included reviewer responsibilities, FOA-specific guidance, and review deadlines. Reviewers received a copy of the Merit Review Criteria, the Application scoring key, the FOA, and the EERE Standard Evaluation and Selection Plan (as modified by the FRD), and Application Summary templates.

The Independent Reviewers independently evaluated the applications in accordance with the merit review criteria described in the FOA. For each review criterion, the Independent Reviewers provided

strengths, weaknesses, and scores on a scale of 1-10 (whole numbers only) based on the scoring key. The overall score assigned by each Independent Reviewer was then calculated using the specified weighting of each merit review criterion. The average of the Independent Reviewer scores was calculated to produce the application's Independent Review score. The comments and scores of the Independent Reviewers are reflected in Attachment 3, *Record of Strengths and Weaknesses – Independent Reviewers Unedited Comments.*

iii. Federal Consensus Board Meeting

For this FOA, the Federal Consensus Board (Board) was of composed of eleven Federal members. See Attachment 2, *Merit Review Appointment Memorandum.*

After the Independent Reviewers submitted their evaluations, the Board convened at 8:30 am EST on Tuesday, March 6, 2018,at the National Renewable Energy Laboratory (NREL) campuses in Washington, DC and Golden, Colorado. The Federal Consensus Board finished deliberations at 4:30pm EST on Thursday, March 8, 2018. First, the Board determined the appropriate Federal merit ratings for each application. Second, the Board determined the selection range by drawing a line between the applications that had achieved an acceptable level of merit and those that had not. Third, the Board developed its recommendations for the Selection Official.

Independent Reviewers who were not members of the Board did not participate in developing the final Federal merit ratings or otherwise participate in determining which applications should be recommended for selection. Had there been any non-Federal reviewers, the Board would have dismissed them prior to making any decisions regarding merit ratings, determining which applications are meritorious, or developing recommendations to the Selection Official.

iv. Federal Merit Ratings

The Board determined the final numeric rating for each application based on the published criteria. The Board considered the Independent Reviewer comments, scores and the application itself.

To reach the final rating, the Board used the average Independent Reviewer ratings and Independent Reviewer comments as a starting point for discussion. The Board assigned scores for each review criteria to ensure that the applications were evaluated consistently. The average of those scores became the final rating. The Board also had discretion to revise the strengths and weaknesses of each application, which are documented in the Merit Review Criteria tool.

a. Selection Range

After determining the appropriate ratings, the Board established the selection range by drawing a line between the applications that met the acceptable level of merit and those that did not (i.e., the Selection Range). (See Attachment 4, *Federal Consensus Board Recommendations to the Selection Official and Record of Federal Technical Merit Ratings*).

b. Selection Recommendations

After determining which applications were meritorious, the Board developed its recommendations for the Selection Official. As required, the development of the selection recommendations was independent of and took place after the Board established the ratings and the selection range. The consideration of the program policy factors and any other selection factors did not impact or change the ratings or the selection range.

The Board's recommendations are set forth in Section IV, which provides the rationale for the recommendations. The Board's recommendations are also shown in Attachment 4.

IV. Federal Consensus Board Recommendations

The Board's recommendations are divided into the following categories:

(a) Applications Recommended for Selection of Award
(b) Applications Recommended as Alternates ("Waitlist")
(c) Applications Not Recommended for Further Action by the Selection Official

The Board developed these recommendations based on merit, using the totality of information obtained through the evaluation review process, along with availability of funding. The Board makes these recommendations with the understanding that any recommendations adopted by the Selection Official are final.

Based on the above considerations, the Board developed the following recommendations (also see Attachment 4).

The following subsections serve to record the Federal Consensus Board's recommendations and will not be modified to match the Selection Official's decisions. The Selection Statement and Analysis will record the Selection Official's decisions.

A. APPLICATIONS RECOMMENDED FOR SELECTION

App. Number	Area of Interest	Con-sensus Score	Applicant	Requested Funding Amount	Recom-mended Funding Amount	Recom-mended Funding
(b) (4)						

Rationale for Applications Recommended for Selection:

The Board recommends a total of 17 applications: five from Area of Interest 1 that received a consensus score of at least 700; nine from Area of Interest 2 that received a consensus score of at least 550; and three from Area of Interest 3 that received a consensus score of at least 575. The Board recommends that all 17 of these applications be funded at 100%.

Area of Interest 1: State Energy Planning

(b) (4)

Rationale:

(b) (4)

Rationale:

(b) (4)

(b) (4)

Rationale:
(b) (4)

(b) (4)

Rationale:
(b) (4)

(b) (4)

(b) (4)

Rationale:
(b) (4)

Area of Interest 2: Innovative Opportunities for Energy Efficiency and Renewable Energy Practices that Improve Energy Affordability, Reliability and Resiliency
(b) (4)

Rationale:
(b) (4)

(b) (4)

(b) (4)

Rationale:
(b) (4)

(b) (4)

Rationale:
(b) (4)

(b) (4)

- (b) (4)
-
-

Rationale:
(b) (4)

Rationale:
(b) (4)

(b) (4)

Rationale:
(b) (4)

Rationale:
(b) (4)

(b) (4)

Rationale:
(b) (4)

Rationale:
(b) (4)

Area of Interest 3: Technical Assistance to Advance SEP Formula Grant Clean Energy Activities

(b) (4)

Rationale:

(b) (4)

Rationale:

(b) (4)

(b) (4)

1. (b) (4)
2.
3.
4.

Rationale:
(b) (4)

B. APPLICATIONS RECOMMENDED AS ALTERNATES

Application Number	Area of Interest	Consensus Score	Applicant	Requested Funding Amount
(b) (4)				

Rationale for Applications Recommended as Alternates:

(b) (4)

Rationale:
(b) (4)

C. APPLICATIONS NOT RECOMMENDED FOR FURTHER ACTION

Application Number	Area of Interest	Consensus Score	Applicant	Requested Funding Amount

(b) (4)

V. Action for the Selection Official

As required by the DOE Merit Review Guide for Financial Assistance, the Selection Official must provide documentation of the selection decisions: Selections for award negotiations and Alternates. The rationale and analyses narrative to support the selection decisions must also be specified in the Selection Statement and Analysis. The Selection Official must explain how the program policy factors or other selection factors were applicable to the decision.

If the Selection Official selects an application that was not considered technically acceptable by the Federal Consensus Board, the Selection Official must document the reasons for doing so, including the consideration of program policy factors, and obtain the written concurrence of the Assistant Secretary for EERE.

In addition, the Selection Official may identify specific negotiation strategies under the category "Negotiation Strategy" in the Selection Statement and Analysis. Negotiations will be conducted in accordance with the strategies provided by the Selection Official. The Contracting Officer will request concurrence from the Selection Official for variations from the negotiation strategy.

Prior to obtaining the Selection Official signature on the Selection Statement and Analysis, the FOA Managers will seek concurrence from the Contracting Officer and Legal Counsel. Once the concurrences are obtained, the final Selection Statement and Analysis will be presented to the Selection Official for signature. The Selection Official will provide the signed Selection Statement and Analysis to the FOA Manager, who will then forward the signed Selection Statement and Analysis to the Contracting Officer.

Attachment 1 (a-b) – Record of Eligibility Review

Attachment 1a. Record of Eligibility Review – Full Applications

SEP Competitive Awards 2017 - Compliance Review Tracker

Compliance Reviewer	Exchange ID #	State	Applicant Name	Project Title	Eligible for Award	Application Received Prior to Deadline	SF424 Application	Meets 20% Cost-Match Requirement	Project/Performance Site Locations	State Energy Assessment	Project Plan	Technical Volume Does Not Exceed 35 Page Limit	SF424A - Budget (Non-Construction Programs)	EERE 335 - Budget Justification	Summary/Abstract for Public Release	Letters of Commitment	Resume/s	SF-LLL - Disclosure of Lobbying Activities	Statements of Support from Key Partners
Pete Davis	(b) (4)				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Davis					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Davis					Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Pete Davis					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Davis					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kelsie Bell					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes
Kelsie Bell					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kelsie Bell					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Kelsie Bell					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Kelsie Bell					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes

SEP Competitive Awards 2017 - Compliance Review Tracker

Compliance Reviewer	Exchange ID #	State	Applicant Name	Project Title	Eligible for Award	Application Received Prior to Deadline	SF424 Application	Meets 20% Cost Match Requirements	Project/Performance Site Locations	State Energy Assessment	Project Plan	Technical Volume Does Not Exceed 35 Page Limit	SF424A - Budget (Non-Construction Programs)	EERE 335 - Budget Justification	Summary/Abstract for Public Release	Letters of Commitment	Resume File	SF-LLL - Disclosure of Lobbying Activities	Statements of Support from Key Partners
Pete Gingrass	(b) (4)				Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Gingrass					Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Gingrass					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Gingrass					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Gingrass					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Gingrass					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Gingrass					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pete Gingrass					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Julie Howe					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Julie Howe					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Julie Howe					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Julie Howe					Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No
Julie Howe					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes

Attachment 1b. - Signed Eligibility Memorandum

FMC 130.1
12-02

U.S. Department of Energy

Memorandum

DATE: January 19, 2018

TO: Robert D. Kingsley, Contracting Officer
Adam DeDent, Legal Counsel

FROM: Charles T. Satterfield, II and Henry D. Fowler, FOA Managers

SUBJECT: State Energy Program 2017 Competitive Awards, DE-FOA-0001644

Twenty-three applications were received by the Golden Field Office in response to the subject FOA. As agreed upon in the Evaluation and Selection Plan, an initial review was performed on all applications submitted in response to the subject FOA by the DOE Golden Field Office to determine the following: (1) the applicant is eligible for an award; (2) the information required by the FOA has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the FOA.

If an application fails to meet these requirements, it may be deemed non-responsive and eliminated from further review. Prior to being determined non-responsive and ineligible for further competition, the concurrence of the Contracting Officer and Legal Counsel is required. It is the intent of the FOA Managers that this Memorandum fulfill the requirements set forth by the Evaluation and Selection Plan to obtain the Contracting Officer and Legal Counsel's concurrence prior to determining an application to be non-responsive and eliminating the application from further review.

Rejected Applications (0)

After completion of the initial review, the FOA Managers did not identify any applications that were unresponsive to the objectives of the FOA. The FOA Managers recommend moving forward with all applications vetted during the eligiblity review process.

Late Applications (2)

During the initial review, the FOA Managers identified two applications that were received after the deadline. However, due to reasons listed below, the FOA Managers do not believe there are sufficient grounds to reject these applications.

Applicant Name: (b) (4)
EERE Exchange Control Number: (b) (4)
Issue: The (b) (4) submitted an application on January 11, 2018 with a 4:57pm EST time stamp.

At 5:13 EST the (b) (4) emailed the $EPCompetitive2017 mailbox with a revised Support letter file, and a note stating, "We were having issues updating the following file (attached) to the application." One additional letter of support was included in the file that was not in the original submission. On January 16, 2018 the Procurement team advised the FOA Managers to request supportive documentation to address the late submittal of the extra letter of support. (b) (4) responded via email on January 17, 2018. After review and consideration, the Contracting Officer determined that the applicant provided enough evidence to forward the application with the revised Support letter file to merit review.

Applicant Name: (b) (4)
EERE Exchange Control Number: (b) (4)
Issue: The (b) (4) submitted an application on January 11, 2018 with a 5:22pm EST time stamp. However, Exchange has a one hour grace period policy that allows DOE to accept applications submitted up until 6pm EST as long as there is evidence that the applicant began the submission process prior to 5pm EST; there is evidence that (b) (4) began the submission process prior to 5pm EST.

At 9:03 EST the (b) (4) emailed their (b) (4), (b) (6) providing a written explanation as to why their application was received after the stated deadline. After review and consideration, the Contracting Officer determined that the applicant provided enough evidence to forward the application to merit review.

Applications Meeting Minimum Criteria for Review (23)

After completion of the initial review, 23 applications were found to be compliant with a majority of the requirements of the FOA and the FOA Managers recommend that these applications be forwarded for Merit Review.

EERE Exchange Control Number	Lead Organization	Area of Interest
(b) (4)		1
		1
		1
		1
		1
		1
		2
		2
		2
		2
		2
		2
		2
		2
(b) (4)		2
		2
		2
		2
		2
		2
		3
		3
		3

The signatures below will allow the 23 applications listed above to be forwarded to merit review

and will indicate concurrence.

Contracting Officer: _____ Date: 1/22/18
Robert D. Kingsley

Legal Counsel: _____ Date: 1/24/2018
Adam DeDent

Attachment 2

Merit Review Appointment Memorandum

The FOA Managers selected the personnel listed below to serve as Independent Reviewers and/or Federal Consensus Board members. The FOA Managers selected personnel to serve as Independent Reviewers from a pre-approved set of reviewers. Any new Independent Reviewers underwent the approval process through the Selection Official or other appropriate approving official to be included in the pre-approved set of reviewers. Additionally, the Contracting Officer, Grants Management Specialist/Contracts Specialist, and Legal Counsel assigned to the FOA are listed.

Name	Duty	Email	Phone	Agency
Greg Dierkers	Independent Reviewer/FMRP Member	greg.dierkers@ee.doe.gov	202-287-1921	DOE
Greg Davoren	Independent Reviewer/FMRP Member	gregory.davoren@ee.doe.gov	202-287-1706	DOE
Jenah Zweig	Independent Reviewer/FMRP Member	jenah.zweig@hq.doe.gov	202-586-5712	DOE
Denise Mulholland	Independent Reviewer	Mulholland.Denise@epa.gov	202-343-9274	EPA
Amy Kidd	Independent Reviewer/FMRP Member	amy.kidd@ee.doe.gov	202-287-1306	DOE
Adam Guzzo	Independent Reviewer	adam.guzzo@ee.doe.gov	202-287-1689	DOE
Alice Dasek	Independent Reviewer/FMRP Member	alice.dasek@ee.doe.gov	202-287-1595	DOE
Amy Jiron	Independent Reviewer	amy.jiron@ee.doe.gov	720-339-7475	DOE
Brandi Martin	Independent Reviewer/FMRP Member	Brandi.Martin@ee.doe.gov	202-586-7983	DOE
Cody Taylor	Independent Reviewer/FMRP Member	cody.taylor@ee.doe.gov	202-287-5842	DOE
Jonah Steinbuck	Independent Reviewer	Jonah.Steinbuck@ee.Doe.Gov	202-586-0844	DOE
Michael DiRamio	Independent Reviewer	michael.diramio@ee.doe.gov	202-287-1441	DOE
Sean Williamson	Independent Reviewer	Sean.Williamson@ee.doe.gov	202-287-6673	DOE
Virginia Castro	Independent Reviewer/FMRP Member	Virginia.Castro@ee.doe.gov	202-287-1543	DOE
Pete Davis	Independent Reviewer/FMRP Member	pete.davis@ee.doe.gov	720-356-1606	DOE
Julie Howe	Independent Reviewer/FMRP Member	julie.howe@ee.doe.gov	720-356-1628	DOE
Kelsie Bell	Independent Reviewer	Kelsie.Bell@ee.doe.gov	720-356-1643	DOE
Pete Gingrass	Independent Reviewer/FMRP Member	pete.gingrass@ee.doe.gov	720-356-1314	DOE
Randall Lamp	Independent Reviewer Contracting Officer	randall.lamp@ee.doe.gov	240-562-1631	DOE
Rochelle Hass	Grants Management Specialist	Rochelle.Hass@ee.doe.gov	720-356-1559	DOE
Bob Kingsley	Contracts Specialist	Bob.Kingsley@ee.Doe.Gov	720-356-1670	DOE
Adam DeDent	Legal Counsel	Adam.DeDent@ee.doe.gov	720-356-1346	DOE

Attachment 3
Record of Strengths and Weaknesses Independent Reviewer Unedited Comments

Independent Reviewers record their scores and strengths and weaknesses for each application through EERE Exchange. Attached is the print out of this record as Attachment 3.

IR Strengths and Weaknesses.pdf

Attachment 4

CONSENSUS BOARD RECOMMENDATIONS TO THE SELECTION OFFICAL
AND
RECORD OF FEDERAL MERIT RATINGS

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER DE-FOA-0001644
STATE ENERGY PROGRAM (SEP) 2017 COMPETITIVE AWARDS

Total Number of Applications: *23*

TECHNICALLY ACCEPTABLE APPLICATIONS: *18*

Selected Yes/No/ Alternate	Application #	App-licant	Federal Share($)	Recom-mended Funding %	Non-Federal Cost Share($)	Cost Match % (minimum 20% required)%	Total Cost($)	Federal Technical Merit Rating	Program Policy Factors ("X" if used)				
									1. Strategic Goals of EERE	2. Diverse Portfolio and Underserved	3. Geographic Diversity	4. Broad Distribution of Programs	5. Underserved in Last Four 4 Years
Yes	(b) (4)		300,000	100	60,000	20	360,000	840					
Yes			300,000	100	62,000	20.67	362,000	790					
Yes			300,000	100	62,240	20.75	362,240	770					
Yes			431,043	100	108,191	25.10	539,234	760					
Yes			300,000	100	75,000	25	375,000	700					
Yes			285,000	100	57,000	20	342,000	810					
Yes			299,996	100	84,352	28.12	384,348	790					
Yes			300,000	100	62,252	20.75	362,252	790					
Yes			500,000	100	343,261	68.65	843,261	750					
Yes			430,400	100	142,007	32.99	572,407	710					
Yes			300,000	100	100,992	33.66	400,992	690					
Yes			300,000	100	60,000	20	360,000	670					
Yes			276,039	100	69,010	25	345,049	640					
Yes			300,000	100	60,000	20	360,000	620					

Alternate	(b) (4)		249,607	100	54,323	0	303,930	550					
Yes			100,000	100	N/A	0	100,000	940					
Yes			100,000	100	N/A	0	100,000	590					
Yes			75,000	100	N/A	0	100,000	580					
APPLICATIONS DETERMINED TO BE NOT TECHNICALLY ACCEPTABLE: 5													
No	(b) (4)		300,000	N/A	75,000	25	375,000	640					
No			300,000	N/A	60,000	20	360,000	520					
No			300,000	N/A	62,235	20.75	362,235	510					
No			300,000	N/A	90,000	30	390,000	360					
No			240,469	N/A	60,118	25	300,587	270					

Rodriguez, Susan (CONTR)

From:	Barth, John
Sent:	Monday, September 10, 2018 2:32 PM
To:	Tripodi, Cathy;Jacob, Bindu;Chalk, Steven;Hogan, Kathleen;Unruh, Timothy
Cc:	Fitzsimmons, Alexander;Jayne, Kevin A.;Pezzullo, Leslie;Garman, Sarah;Roy, Molly;Hamos, Ian;Booher, Patrick;Kaarsberg, Tina
Subject:	EERE SBIR FY 2019 Phase I Release 2 Topics Review Package
Attachments:	EERE SBIR FY19 PIR2 Topics Action Memo 090718.docx; Overview of Annual SBIR Schedule.pdf; EERE FY19 Phase I Release 2 Topics 9 7 18.docx; Subtopics Priorities Crosswalk.docx

Cathy and DASs,

Attached is an action memo with three attachments presenting the proposed FY19 SBIR topics, and requesting your review/approval/modifications.

As you can see from the memo and the attached schedule, the DAS response is requested by 19 September. Once we consolidate the DAS responses, we will provide Cathy with an updated version for her review, which we request by 3 October.

Please let Dr. Kaarsberg or myself know if you have any questions or concerns.

Thank you,
John

MEMORANDUM FOR: Cathy Tripodi
Acting Assistant Secretary
Energy Efficiency and Renewable Energy

Kevin Jayne
Special Advisor to Cathy Tripodi

Bindu Jacob
Deputy Assistant Secretary
Office of Operations

Dr. Kathleen B. Hogan
Deputy Assistant Secretary
Office of Energy Efficiency

Steve Chalk
Deputy Assistant Secretary
Office of Transportation
Acting Deputy Assistant Secretary
Office of Renewable Power

THROUGH: John Barth
Director
Budget Office

FROM: Dr. Tina Marie Kaarsberg
Program Manager
Small Business Innovation Research/Technology Transfer

DATE: SEPTEMBER 7, 2018

SUBJECT: ACTION: Review of EERE SBIR/STTR FY 2019 Phase I Release 2 topics.

ISSUE: FY 2019 EERE SBIR/STTR Phase I Release 2 topics should be reviewed by EE-1 or a designee and all DAS's before sending to DOE's Office of Science.

- The EERE SBIR/STTR Standard Operating Procedure (SOP) (EERE 850) guidelines suggest that EE-1 or a designee and all of the DAS's review the EERE SBIR/STTR topics for approval. Therefore, we recommend that
    - DAS's or a designee review the Phase I Release 2 topics document (Attachment 2) **by Wednesday, September 19,** and propose any changes by that time.
    - EE-1 or a designee review the Phase I Release 2 topics document (updated document to be provided upon completion of DAS review) **by Wednesday, October 3**, and propose any changes by that time.

BACKGROUND:

- The Small Business Innovation Research (SBIR) & Small Business Technology Transfer (STTR) programs use a congressionally-mandated set-aside (3.65% of FY19 R&D funding) to provide R&D funds to small businesses, enabling them to further develop innovative products. New awards are known as Phase I awards, and follow-on awards are known as Phase II awards.
- There are two calls for proposals each year, called "Releases." EERE funds awards for Release 2. Attachment 1 provides an overview of the annual SBIR schedule. "Topics" for Release 2 are scheduled to be provided to the public in October of each year.
- Topics and subtopics are short descriptions of technology areas of interest released to the public ahead of the formal SBIR FOA release. Topics are released prior to the FOA to allow applicants to identify technology areas of interest and begin formulating innovative responses and partnerships. The topics in this package were approved by the corresponding Technology Office Directors. Only two of the 40 subtopics are repeats from last year.
- The Department of Energy's SBIR/STTR programs are run by the DOE SBIR/STTR Office housed in the Office of Science. EERE's SBIR/STTR team helps EERE comply with the SBIR/STTR statute by coordinating across EERE Tech Offices.
- Attachment 3, a listing of all the Topics, subtopics, and corresponding EERE priorities shows that all of the Topics address some of the priorities and all of the EERE topic priorities are addressed by some of the subtopics. In contrast, the partnership priorities were not as well represented. Only one subtopic each for OE and CESER are in discussion for joint efforts with EERE. We welcome your input on how to increase such partnerships.
- Upon submission to the Office of Science, EERE's topics will be reviewed, edited if needed. The topics will then be issued on October 29, followed by the FY 2019 Phase I Release 2 Funding Opportunity Announcement (FOA) on November 26.

RECOMMENDATION: To review the FY 2018 EERE SBIR/STTR Phase I Release 2 topics and provide feedback or approval, or assign responsibility of review/approval to a designee.

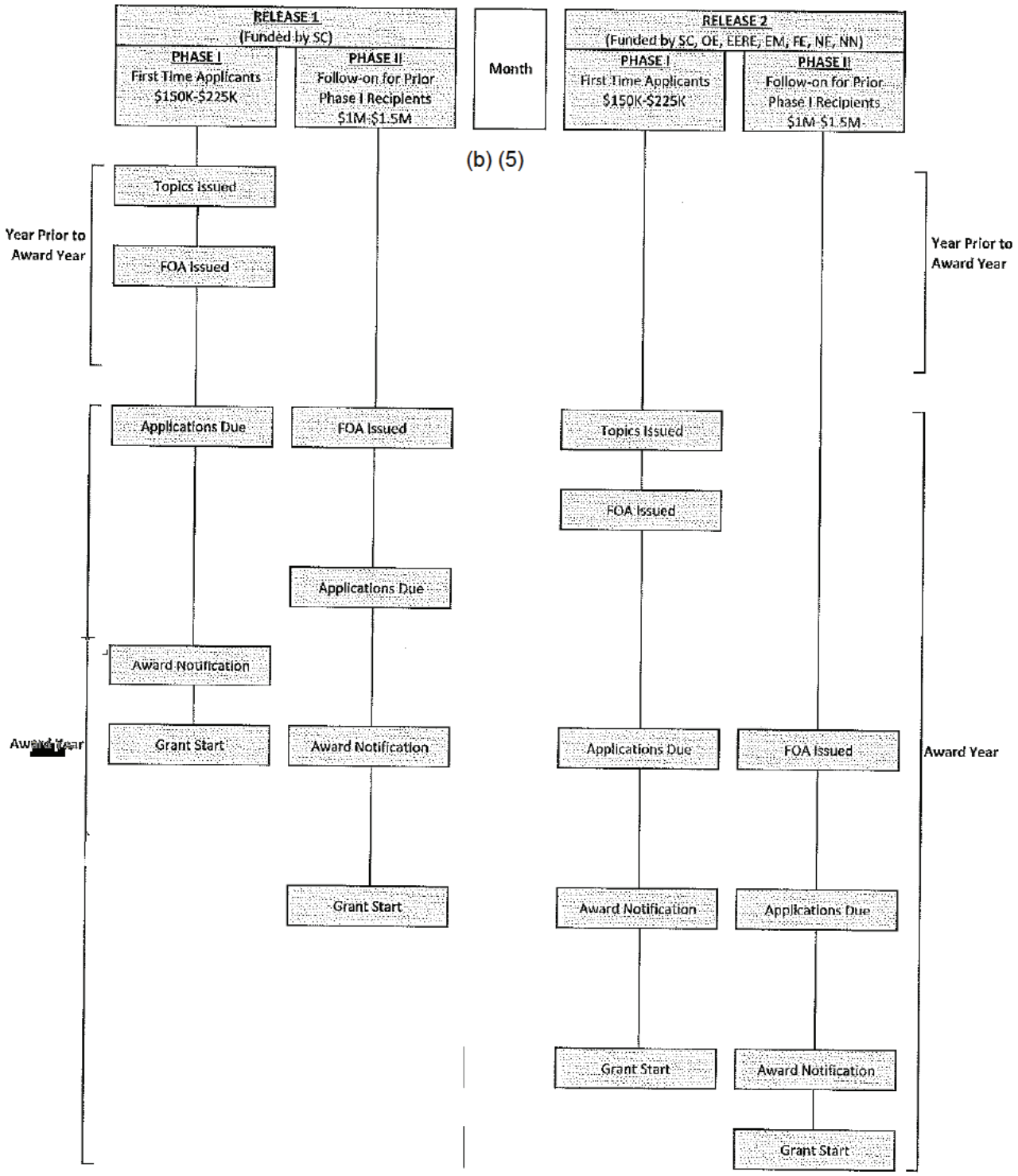
Topics Approved: _____ Will Provide Feedback on Topics: _____

Indicate Designee to Review Topics: _____

Date: _____

ATTACHMENTS:

1. Overview of annual SBIR schedule
2. EERE SBIR/STTR Phase I Release 2 Topics Document
3. 40 Subtopics and Priorities


RELEASE 1
(Funded by SC)
PHASE I
First Time Applicants
$150K-$225K
PHASE II
Follow-on for Prior
Phase I Recipients
$1M-$1.5M
Month
RELEASE 2
(Funded by SC, OE, EERE, EM, FE, NE, NN)
PHASE I
First Time Applicants
$150K-$225K
PHASE II
Follow-on for Prior
Phase I Recipients
$1M-$1.5M
(b) (5)
Year Prior to
Award Year
Topics Issued
FOA Issued
Applications Due
Award Notification
Grant Start
Award Year
FOA Issued
Applications Due
Award Notification
Grant Start
Topics Issued
FOA Issued
Applications Due
Award Notification
Grant Start
FOA Issued
Applications Due
Award Notification
Grant Start
Year Prior to
Award Year
Award Year

#2894.356

FY 2019 EERE Small Business Innovation Research (SBIR) & Small Business Technology Transfer (STTR) Topics

1. **ADVANCED MANUFACTURING**
    a. Manufacturing Cybersecurity
    b. Atomic Precision for Gaseous Separations
    c. Covetic Processing of Critical Materials and Strategic Materials
    d. Technology Transfer Opportunity: Electrochemical Recycling Electronic Constituents of Value (E-RECOV)
2. **BIOENERGY**
    a. Cell-Free Biochemical Platforms to Optimize Biomass Carbon Conversion Efficiency
    b. Reshaping Plastic Design and Degradation
    c. Algae Engineering Incubator
3. **BUILDINGS**
    a. Next Generation Residential Air Handlers
    b. Novel Materials and Processes for Solid-State Lighting
    c. Automated Point Mapping for Commercial Buildings
    d. Complementing Building Energy Modeling (BEM) with Non-Energy Analyses
4. **FUEL CELLS**
    a. Fuel Cell Membranes and Ionomers
    b. Nozzles for High-Pressure, Low-temperature Gas Fills
    c. Active Low Cost Thin Film Hydrogen Sensors
    d. Smart Sensors for Structural Health Monitoring (SHM) of Composite Overwrapped Pressure Vessels (COPVs) of On-board Hydrogen Storage for Fuel Cell Electric Vehicles (FCEVs)
    e. Innovative Concepts for Hydrogen Conversion to Liquid Hydrocarbon Fuels
5. **GEOTHERMAL**
    a. Improved downhole telemetry for geothermal drilling
6. **SOLAR**
    a. TECHNOLOGY TRANSFER OPPORTUNITY: Real-Time Series Resistance Monitoring in Photovoltaic Systems
    b. TECHNOLOGY TRANSFER OPPORTUNITY: PV module Soiling Spectral Deposition Detector
    c. Storage technologies to enable low-cost dispatchable solar photovoltaic generation
    d. Hardened solar system design and operation for recovery from extreme events
    e. Rural solar
    f. Affordability, reliability, and performance of solar technologies on the grid
7. **VEHICLES**
    a. Electric Drive Vehicle Batteries
    b. SiC devices suitable for Electric Vehicle Extreme Fast Chargers
    c. Reduction of Thermal and Friction Losses in Internal Combustion Engines
    d. Co-Optimization of Fuels and Engines
    e. Improving the Performance and Reducing the Weight of Cast Components for Vehicle Applications
    f. Low Cost, Lightweight, and High-Performance Fiber-Reinforced Composites for Vehicle Applications
8. **WATER**
    a. Microgrid for Improved Resilience in Remote Communities through Utilization of Marine Hydrokinetics and Pumped Storage Hydropower
    b. Ocean Energy Storage Systems

c. Pumping and Compression using Marine and Hydrokinetic Energy
d. High Value Critical Mineral Extraction from the Ocean Using Marine Energy

9. WIND

a. Coordinated and Secure Distributed Wind System Control and Communications Technologies
b. Remote Diagnostic Technologies to Reduce Offshore Wind Operating, Maintenance, and Repair Costs, and Increase System Reliability
c. Other in Wind Turbine Blade Recycling

10. JOINT TOPIC: ADVANCED MANUFACTURING AND SOLAR ENERGY TECHNOLOGIES OFFICES

a. Innovation in solar module manufacturing processes and technologies

11. JOINT TOPIC: ADVANCED MANUFACTURING AND GEOTHERMAL TECHNOLOGIES OFFICES

a. Geothermal Desalination and Critical Material Recovery Systems
b. Desalination and Critical Material Recovery Systems from Other Energy Sources

12. JOINT TOPIC: ADVANCED MANUFACTURING AND FUEL CELL TECHNOLOGIES OFFICES

a. Advanced Materials for Detection and Removal of Impurities in Hydrogen

PROGRAM AREA OVERVIEW: OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

The Office of Energy Efficiency and Renewable Energy (EERE) is at the center of creating the clean energy economy today. EERE leads the U.S. Department of Energy's efforts to develop and deliver market-driven solutions for energy-saving homes, buildings, and manufacturing; sustainable transportation; and renewable electricity generation.

EERE's Technology Office activities are conducted in partnership with the private sector (including small businesses), DOE national laboratories, universities, and state and local governments. EERE also works with stakeholders to develop programs and policies to facilitate the deployment of advanced clean energy technologies and practices. EERE's fiscal year 2019 budget request can be found here: https://www5.eere.energy.gov/office_eere/current_budget.php.

1. ADVANCED MANUFACTURING

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount: (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Advanced Manufacturing Office (AMO) (https://energy.gov/eere/amo) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Manufacturing Cybersecurity

Manufacturing is most vulnerable to cyber-attacks and disruption to processes, rather than to data – and among manufacturing systems, industrial controls have been identified as most vulnerable. This issue is especially important for small and medium- sized manufacturing enterprises, which usually buy and use commercial control technology – and lack personnel dedicated to maintaining control system integrity. Furthermore, many control systems in use in US manufacturing are older and are not easily upgraded due to cost and the need for a smaller manufacturer to maintain production without interruption.

This SBIR topic provides the opportunity for small business to work with industrial control developers, vendors, suppliers, standards organizations and end users to investigate and develop cost-effective technology solutions to industrial control vulnerability. End users of special importance are small to medium- sized manufacturing enterprises that typically buy commercial control technology for their use and do not have the means to develop technology to ensure control security. Phase 1 grant applications for feasibility research are invited the following subtopic areas:

- Encryption technology for digital control: Many control loop signals are typically digitized at some point in manufacturing operations, digital control is provided directly by Direct Digital Controllers DCC or Programmable Logic Controllers PLC. These controllers do not typically come with encryption technology, making digital signals susceptible to corruption. Phase I exploratory investigations for the development of digital control encryption technology are invited, especially for technology directed to legacy digital control circuitry that was not provided with encryption capability originally.
- Technology for redundancy checking in legacy control systems: Manufacturing process corruption could appear as complete process disruption, or more insidiously through willful changes introduced almost imperceptibly over time. Phase 1 grant applications are invited for investigations in technology development for legacy control system integrity. Such technology is especially important for critical precision applications such as computer numeric controls applied in discrete parts manufacture
- Wireless sensor signal encryption: Most wireless sensors in industrial applications do not provide an encrypted signal to the control element or the controller. Those applications are vulnerable to willful disruption or distortion., Analog or digital encryption would protect the integrity of the control system. Phase 1 grant applications are invited for wireless sensor encryption technology, and it is expected that investigators will work with appropriate standards and communications authorities for technology development that can be commercialized successfully

Questions – contact Brian.Valentine@ee.doe.gov

b. Atomic Precision for Gaseous Separations

This subtopic is focused on exceptional energy performance in water purification, water separation, and strategic gas and liquid chemical separations. We seek to advance materials designs for atomically precise membranes for world class selectivity, permeance, and chemical stability.

Atomically precise is defined as: Materials, structures, devices, and finished goods produced in a manner such that every atom is at its specified location relative to the other atoms, and in which there are no defects, missing atoms, extra atoms, or incorrect (impurity) atoms. Thus, we are targeting extraordinary materials that are essentially defect free. As deposition processes cannot produce defect-free structures, the only currently available assembly method is to design molecules that self-assemble into defect-free molecular layers. Proposals for methods that do not synthesize membranes using molecular self-assembly will be declined without review. Graphene-based layered membranes are explicitly excluded and proposals for graphene membranes will not be considered to be responsive.

We seek to further advance the development of this new class of strong, thin, and atomically precise membrane materials for separations that provide a 10X permeance improvement over State-of-the-Art polymer membranes. They would have thicknesses generally below 10 nm for high permeance, incorporate atomically precise molecular pores for 100% selectivity, be atomically flat to prevent fouling, and heavily

cross-linked for environmental stability. These membranes offer the potential to provide game-changing process energy advances.

The subtopic seeks proposals focused on the separation of gases. The separation of gases into high value products can be game changing for a variety of energy applications. In principle, a series of membranes of sufficient selectivity could separate air into its raw components of N2, O2, Ar, CO2, Ne, He, etc. for U.S. manufacturing of high value products at a competitive advantage. Helium could also be effectively separated from particular natural gas sources where it is concentrated (in the Great Plains, for example) without the need for energy intensive cryogenic treatment. Ethane and propane could be separated from natural gas at low energy cost and sold profitably without the need or infrastructure for cracking, and CO2 could be removed from natural gas with low energy consumption to improve its heating value. CO2 could also be recovered from combustion gases at the source and reused as carbon feedstock for transformation to high value hydrocarbons [1-4].

Responsive proposals will (a) provide evidence that the respondent has the experience and capability to design atomically precise membranes via molecular self-assembly, (b) outline the approach to the molecular design, (c) include milestones and deliverables for physics-based modeling of the membrane, and (d) ideally provide for some synthesis and testing of the design. Whether or not a fully functional membrane is proposed for Phase I, there should be some chemical synthesis component to test out a key aspect of the approach; that is, this is not intended to be a "paper" study only. As this is a novel approach to the separation of gases, wider system design issues may also arise; these may be included as part of a proposal, but the main emphasis must still be on the novel molecular design.

Questions – contact david.forrest@ee.doe.gov

c. Covetic Processing of Critical Materials and Strategic Materials

Covetic nanomaterials are metals in which a network of graphene ribbons and nanoparticles has been created using an electrical conversion process in liquid metal [1-5]. Unlike ordinary graphene, the covetic phase exhibits exceptional stability--it persists after remelting and it resists being burned off in the ASTM E1019 method for carbon analysis. Covetics can conduct heat and electricity more efficiently than conventional metals, and appear to be more oxidation resistant. Covetic nanomaterials are likely to be commercially important because the process is inexpensively scalable to tonnage quantities. This implies the potential for widespread usage in thousands of energy production, transmission, and storage applications, and to improve energy efficiency for U.S. manufacturing. Cross-cut: the process is of interest to the Advanced Manufacturing Office because it can be performed on a wide range of commercially important critical materials and strategic materials and because it represents a leading-edge opportunity for US manufacturers. Key technical hurdles need to be addressed and low volume high-value-added applications need to be identified and pursued to introduce covetics into commercial production. Areas of particular interest include:

- Application development: We seek advances in covetic alloy development for low volume, high value-added applications as an entrée to commercialization. This may involve critical materials such as rare earths, strategic materials [6] such as lithium and hafnium, high value alloys, or precious metals. We would like to see the process performed on previously unexplored elemental metals and alloys that make commercial sense. The proposed development effort should identify the low volume, high value-added target alloy and application, quantify the commercial potential, specify a plan for conversion

and chemical analysis, and include the thermophysical and mechanical property tests to be conducted. The composition and amount of physical material to be made should be explicitly proposed. The processing of that material should be explicitly proposed, including conversion parameter windows, and particularly thermomechanical deformation parameters and heat treatment. AMO recognizes that there are a limited number of laboratories with the capability to make these materials; applicants should already have some experience in working with covetic nanomaterials or be partnered with those with experience. Proposals with applicants claiming the ability to make covetics, without prior proof of conversion (including enhanced thermal and electrical conductivity), will be declined without review.

- Chemical analysis: We seek advances in the ability to inexpensively analyze the levels of converted and unconverted carbon in covetics. ASTM E1019 does not seem to be effective in measuring the covetic phase [3], and there is an unresolved controversy in this method's ability to distinguish converted vs. unconverted carbon. GDMS also does not seem to be effective. Carbon analysis using Energy Dispersive Spectroscopy on SEM samples is susceptible to chamber contamination, can be expensive, and cannot distinguish between converted and unconverted forms. The same goes for XPS, with the additional problem of poor statistics from small sample size. Raman and EELS can detect the graphene form but cannot provide good statistics on bulk concentrations because of the small sample volumes being measured. DC PES requires a full analysis of all trace elements, may be highly inaccurate at low carbon concentrations, and cannot distinguish between converted and unconverted forms of carbon. Responsive proposals should include a systematic approach (and novel techniques) to determine total carbon, unconverted carbon, and converted carbon. Specific metallurgical alloys or elements should be proposed with a justification for the expected successful outcome. We seek novel techniques, perhaps taking advantage of unique strong binding between the metal matrix and nanocarbon phase. AMO recognizes that there are a limited number of laboratories with the capability to make these materials; applicants should already have some experience in working with covetic nanomaterials or work with those with experience in order to obtain reference samples.
- Process development: Laboratory synthesis of covetics has proven to be less than straightforward, with inconsistent conversion yields and wide variations in resultant properties. Batch conversion methods will not necessarily scale well to continuous production methods, and a "re-invention" of the process may be required in that case. We seek proposals that address fundamental improvements to the conversion process based on known issues and principles of physics and process metallurgy; these issues should be made explicit in the proposal. Applicants should have appropriate IP positions and agreements in place to proceed with process innovations. Responsive proposals will provide a clear exposition of the fundamental process issue, why this is a problem, and how the proposed work will address the issue and improve and advance the capability of the covetic conversion process. Upgrades to equipment infrastructure will be considered as part of the proposed work. Proposed experiments to verify process improvements must include appropriate plans to measure improvements in conversion effectiveness. A design of experiments approach to optimize process parameters will not be considered responsive to this solicitation.

Questions – contact David.Forrest@ee.doe.gov

d. Technology Transfer Opportunity: Electrochemical Recycling Electronic Constituents of Value (E-RECOV)

About 60 percent of the eight million tons of electronic waste generated annually in the U.S. ends up in landfills. This electronic waste represents a significant feedstock of valuable base, precious and rare earth

metals. Current electronic waste recycling efforts are primarily focused on only precious metal recovery. Processing facilities are located overseas where unsustainable acid leaching or toxic smelting processes are used and in many cases lack environmental and worker safety controls. There is a growing need to employ safe, cost effective processes within the U.S. to capture all valuable (and in some cases strategic) materials from electronic waste streams. Such technologies enhance the security of the American people by limiting the dependence on foreign supplies of these materials while also creating new opportunities for American manufacturing.

Researchers at Idaho National Lab have developed a novel electrochemical process to safely dissolve non-ferrous metals from electronics leading to more complete recovery of recyclable materials while requiring up to 75 percent less chemical reagent than hydrometallurgical processes of comparable scale. The E-RECOV process efficiently recovers the base metals (copper, tin, zinc and nickel) thus allowing precious metals (silver, gold and palladium) to be recovered more efficiently using industry standard methods. The E-RECOV process continuously regenerates the initial oxidizer at the anode, giving the process solution a long life, resulting in significant savings in reagents and waste treatment. The result is reduced chemical use and production of multiple value products. There are options to recover rare earth elements if the feedstock contains appropriate content.

This Technology Transfer Opportunity seeks to leverage an electrochemical process and associated novel system of reactors to recover metals from electronic waste developed at Idaho National Lab, under funding from the Critical Materials Institute. The ideal candidate for this TTO opportunity will have an expertise in sourcing specific electronic waste such as printed circuit boards, knowledge of abrasive feedstock size reduction and processing and a knowledge of implementation of hydro and electrometallurgy based processes. The targeted outcome will be demonstration and scale up of the process to remove metals of value from electronic waste streams.

Idaho National Laboratory Information:
Licensing Information:
License type: Exclusive or Non-Exclusive, please include description of intended field of use in proposal.
Patent Status:

- U.S. Patent No. 9,777,346
  Methods for Recovering Metals From Electronic Waste, and Related Methods
  Issued October 3, 2017.
- U.S. Patent Application No. 15/690,717
  Methods for Recovering Metals From Electronic Waste, and Related Methods
  Filed October 30, 2017.

Questions – contact jonathan.cook@inl.gov and tara.gonzalez@ee.doe.gov

Subtopic a) References:
[1] Cybersecurity For Manufacturers: Securing the Digitized and Connected Factory. September 2017.
https://cra.org/ccc/wp-content/uploads/sites/2/2017/10/MForesight-Cybersecurity-Report.pdf
[2] Cybersecurity Framework Manufacturing Profile. NISTIR 8183, September 2017.
https://nvlpubs.nist.gov/nistpubs/ir/2017/NIST.IR.8183.pdf
[3] Guide to Industrial Control Systems (ICS) Security. NIST Special Publication 800-82, May 2015.
https://nvlpubs.nist.gov/nistpubs/specialpublications/nist.sp.800-82r2.pdf

Subtopic b) References:

[1] Cohen-Tanugi, D., and Grossman, J.C., 2015, Nanoporous Graphene as a Reverse Osmosis Membrane: Recent Insights from Theory and Simulation, Desalination, Vol. 366, p. 59-70. http://www.rle.mit.edu/gg/wp-content/uploads/2016/03/04_NanoporousGraphene.pdf
[2] Assanis, et al., 2000, Study of Using Oxygen-Enriched Combustion Air for Locomotive Diesel Engines, Journal of Engineering for Gas Turbines Power, Vol. 123, Issue 1, p. 157-166. http://gasturbinespower.asmedigitalcollection.asme.org/article.aspx?articleid=1421153
[3] Kurunov, I.E., and Beresneva, M.P., 1999, Effect of Enriching the Blast with Oxygen on the Production Cost of Pig Iron, Metallurgist, Vol. 43, Issue 5, p. 217-220. http://link.springer.com/article/10.1007/BF02466966
[4] Ramasubramanian, K., Verweij, H., and Ho, W.S.W., 2012, Membrane processes for carbon capture from coal-fired power plant flue gas: A modeling and cost study, J. Membr. Sci., 421-2 299-310 http://www.sciencedirect.com/science/article/pii/S0376738812005789

Subtopic c) References:

[1] Forrest and Balachandran, "Carbon Covetic Nanomaterials Show Promise," Advanced Materials & Processes, v. 175, no. 6, Sept. 2017, p. 30. https://static.asminternational.org/amp/201706/files/assets/common/downloads/AMP_DigitalEdition_September.pdf
[2] Bakir and Jasiuk, "Novel metal-carbon nanomaterials: A review on covetics," Advanced Materials Letters, v. 8, no. 9, June 2017, p. 884-890. https://www.researchgate.net/publication/317865542_Novel_metal-carbon_nanomaterials_A_review_on_covetics
[3] Forrest, et al., "Novel Metal-Matrix Composites with Integrally-Bound Nanoscale Carbon," Nanotech 2012, Santa Clara, CA, 18 June 2012. http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA559436
[4] U.S. Patent 8647534, Copper-carbon composition, https://patents.justia.com/patent/8647534
[5] U.S. Patent 9273380, Aluminum-carbon compositions, https://patents.justia.com/patent/9273380
[6] Defense Logistics Agency strategic materials: http://www.dla.mil/HQ/Acquisition/StrategicMaterials/Materials/

Subtopic d) References:

[1] https://factsheets.inl.gov/FactSheets/8ERECOV.pdf
[2] LA Diaz, TE Lister, JA Parkman, GG Clark - Journal of Cleaner Production, 2016 – Elsevier https://www.sciencedirect.com/science/article/pii/S0959652616301299
[3] TE Lister, P Wang, A Anderko - Hydrometallurgy, 2014 – Elsevier https://www.sciencedirect.com/science/article/pii/S0304386X14001820

2. BIOENERGY

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount: (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Bioenergy Energy Technologies Office (BETO) has a mission to help transform the nation's renewable and abundant biomass resources into cost-competitive, high-performance biofuels, bioproducts, and biopower. BETO is focused on forming partnerships with key stakeholders to develop and demonstrate technologies for advanced biofuels production from lignocellulosic and algal biomass as well as waste resources.

All applications to this topic must:

- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP and/or state of the art products or practices);
- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Provide a path to scale up in potential Phase II follow on work;
- Fully justify all performance claims with thoughtful theoretical predictions or experimental data;
- Be based on sound scientific principles (i.e. abides by the law of thermodynamics).

Grant applications are sought in the following subtopics:

a. Cell-Free Biochemical Platforms to Optimize Biomass Carbon Conversion Efficiency

The Bioenergy Technologies Office is interested in expanding the use of cell-free systems to further upgrade cellulosic sugars, lignin compounds, and other waste streams into biofuels and bioproducts. Cell-free biosynthesis technologies are a means of utilizing biocatalysts (enzymes) to perform complicated biochemical reactions that often cannot occur with industrial inorganic catalysts. As a historical example, cell-free systems have been used to convert cellulose into glucose for the production of ethanol [1].

Cell-free biosynthesis technologies offer unique advantages compared to conventional microbial fermentations. These include the ability:

- to direct higher fractions of carbon to product as opposed to cell maintenance thereby increasing yield [2];
- to obviate the risk of producing or accumulating toxic intermediates to the cell [3];
- to reduce capital costs and increase operational throughput by implementing novel reactor designs [4];
- to create *de novo* synthesis pathways by "mixing and matching" of enzymes and/or lysates from different organisms [5].

Significant challenges exist prior to these types of technologies being expanded to the applications described above. At the recent Cell-Free Synthetic Biology and Biocatalysis Listening Day (https://www.energy.gov/eere/bioenergy/cell-free-synthetic-biology-and-biocatalysis-listening-day), participants identified several key technical barriers that need to be overcome. These technical barriers, enzyme stability, cofactor regeneration, and novel enzyme production hosts and purification strategies, make up the three areas of focus for this subtopic. Applications to this subtopic should address only one of these focus areas in their proposal.

Area 1, Enzyme stability: Enzyme stability represents a significant technical and economic hurdle to technology development in this space. Without enzymes or lysates that are stable on the order of weeks, significant fractions of carbon will otherwise be used in generating the biocatalysts required of these systems. If the enzyme(s) are being scaffolded, the enzyme stability should be demonstrated in this context.

Area 2, Cofactor Regeneration: Inherent to cellular fermentations is the need to balance reducing equivalents (NADH and NADPH) which is achieved through the conversion of pyruvate to Acetyl-CoA, ferredoxin reductases, etc. Equally important are methods to perform adenosine triphosphate (ATP) replenishment in the cell-free system. It is simply not economically feasible to supplement a cell-free system with these compounds, so they need to be sustained in-vitro. [#] Opgenorth et al. 2014 describes one such method of balancing these cofactors in order to have these available for subsequent enzymes.

Area 3, Novel enzyme production hosts and purification strategies: Current cell-free systems rely largely on the bulk production of enzyme using E. coli as a host. As such, the range of enzymes and lysates is limited to those that can be successfully heterologously expressed in *E. coli.*

General Requirements:

- Proposed systems must utilize cellulosic sugars, lignin, or wet waste streams as the primary feedstock to produce biofuels or bioproducts. Proposed systems can also utilize biological intermediates as starting materials (e.g. acetate, pyruvate, butyrate, etc.)
- Applications must address the current state of the art for the production of their target biofuel or bioproduct. At a minimum they need to identify the titer, rate, and yield.
- Product yield calculations need to account for the substrate that is used to produce the purified enzymes and/or lysate
- By the end of phase I, projects must have a strategy for eliminating the need for exogenous cofactors (e.g. ATP, NADH, etc.)
- Methods for enzyme purification from the original host must be considered as this can constitute significant costs.

Questions – contact david.babson@ee.doe.gov

b. Reshaping Plastic Design and Degradation

Plastics are a hallmark of modern life and consumer use of plastics is projected to grow over the coming decades, yet only about 2% of plastics like bottles are recycled into the same or similar-quality applications [1]. This subtopic will focus on two areas of R&D: Designing Plastics for a Circular Carbon Economy and Reimagining Plastic Degradation for Upcycling. Applicants should address only one of the R&D focus areas in their proposal.

Area 1: Designing Plastics for a Circular Carbon Economy
Modern plastics need to be designed and manufactured with recyclability in mind. Biobased feedstocks are well-suited for designing the plastics of the future due to their composition and structure. Unlike traditional feedstocks, which contain primarily carbon-carbon and carbon-hydrogen bonds, biobased feedstocks contain cleavable oxygen linkages which could be incorporated into the design of new plastics, essentially introducing "zippers" that allow for facile deconstruction at the end of the product's life [2]. In addition, biobased feedstocks can allow access to chemical structures which are not economical to access from petroleum, potentially providing new avenues to access performance-advantaged materials with novel properties. The Department of Energy is seeking proposals targeting bio-derived plastics designed with end-of-life considerations in mind that can enable a circular carbon economy.
Other considerations include:

- Proposed systems must utilize bio-based feedstocks including lignocellulosic biomass, cellulosic hydrolysates, and other lignocellulose-derived intermediates. Feedstocks used for feed or food will be deemed unacceptable.
- Proposals must discuss end-of-life considerations and thoroughly explain the proposed material's advantages over petroleum derived materials. This includes methods to quantitatively characterize of the end-of-life properties of the proposed material.
- Proposals are encouraged to explore performance-advantaged plastics that in addition to superior end-of-life considerations can outperform traditional plastics for a specific, chosen application.

Area 2: Reimagining Plastic Degradation for Upcycling

Only a small fraction of the 60 million tonnes of plastic used in the United States is recycled, and an even smaller fraction is made into similar quality products as the original plastic, due to a loss in material properties during the recycling process [3]. The rest of plastic waste typically ends up in either landfills or the environment, causing ecological damage. Better methods are needed to address the large waste-disposal problem presented by currently used plastics. This topic will focus on ways to remake our current systems for plastic disposal and recycling with a focus on utilizing an array of plastics as feedstocks for value-added applications. The Department of energy is seeking proposals exploring challenges in selective C-O, C-N, and C-C chemistry, crystallinity, feedstock contamination, breakdown rate, and other innovative ideas to address difficulties with plastic degradation and upcycling. Proposals are encouraged to target systems with low energy requirements as opposed to systems like gasification which have previously been thoroughly investigated for these feedstocks [4].

Other considerations include:

- Proposed systems must target waste plastic streams including but not limited to polyethylene, polypropylene, polystyrene, polyethylene terephthalate, polyurathanes, nylons, polyamides, and polylactams.
- Proposals are encouraged to target mixed or contaminated waste plastic streams with their eventual system configurations, though this is not required for Phase I.
- Proposals are encouraged to target value-added output streams, for example compounds that are more valuable than mixed polymer-derived monomer streams, though this is not required.
- Chemical and biological processes are both of interest.

Questions – contact jay.fitzgerald@ee.doe.gov

c. Algae Engineering Incubator

BETO's Advanced Algal Systems subtopic, "Algae Engineering Incubator" is intended to identify potentially impactful ideas that are not meaningfully addressed in the subprogram's project portfolio. The subtopic will be open to all applications that propose the development of technologies that facilitate the goals of the Advanced Algal Systems R&D subprogram through non-biological, engineering approaches. Applicants can review the 2017 Peer Review [1] and 2015 Peer Review [2] reports to identify what non-biological, engineering R&D has already been funded in the portfolio.

The scope for this subtopic is intentionally broad. Examples of proposals that fit this subtopic are the development of equipment that improves laboratory experimental throughput or data quality, the creation of technologies that assist in monitoring and automation of cultivation, and the testing of new materials to reduce the capital expenses of cultivation systems.

Applicants should clearly describe how they will meet the Advanced Algal System's goals or how success of their project will facilitate the success of performers in BETO's algae portfolio.

Applications specifically not of interest

- Applications that propose to conduct R&D that was the primary focus of previous funding opportunities. Examples of work supported by previous funding opportunities are:
- Recovery of nutrients from conversion to recycle back to cultivation;
- Development of harvest/processing technology;
- Development, characterization, and valorization of finished biofuels and bioproducts from algal biomass;
- Research on biological improvements, including engineering of strains and cultivation ecology;
- Research on increasing carbon utilization efficiencies of algal cultivation as well as on developing direct air capture technologies.
- Applications that propose to develop technology that relies on purely heterotrophic algae cultivation.
- Applications that propose mixotrophic algae cultivation strategies that utilize food-based sugars (i.e., derived from food-based crops including but not limited to corn, beets, sorghum, and sugar cane).
- Applications that propose to develop technology for the artificial lighting-based cultivation of algae for energy products (other than as an enabling tool for high throughput laboratory-based screening).
- Applications that propose to work on biomass other than algae biomass (e.g. lignocellulosic biomass, non-algae microorganisms, fungi, etc.).

Questions – contact devinn.lambert@ee.doe.gov

Subtopic a) References:

[1] National Renewable Energy Laboratory. 1993. "'Mini-Manhattan Project' for Cellulases". https://www.nrel.gov/docs/legosti/old/5676.pdf
[2] Opgenorth et al. 2014. "A synthetic biochemistry molecular purge valve module that maintains redox balance." Nat. Commun. doi: 10.1038/ncomms5113.
[3] Opgenorth et al. 2017. "A molecular rheostat maintains ATP levels to drive a synthetic biochemistry system." Nat. Chem Biology. doi: 10.1038/nchembio.2418
[4] Nussbaumer et al. 2017. "Bootstrapped biocatalysis: biofilm-derived materials as reversibly functionalizable multienzyme surfaces." ChemChem. doi.org/10.1002/cctc.201701221
[5] Dudley et al. 2016. "Cell-free mixing of Escherichia coli crude extracts to prototype and rationally engineer high-titer mevalonate synthesis." ACS Synth. Biol. DOI: 10.1021/acssynbio.6b00154

Subtopic b) References:

[1] S. Lemonick. Chemical and Engineering News. 96, 25 (2018)
[2] S. Lemonick. Chemical and Engineering News. 96, 25 (2018)
[3] J.M. García J, M.L. Robertson, M. Science. 358, 6365 (2017)
[4] A. Rahimi, J. M. García. Nat. Rev.Chem. 1, 0046 (2017).

Subtopic c) References:

[1] U.S. Department of Energy, Bioenergy Technologies Office, 2017 Project Peer Review. Retrieved September 5, 2018, from https://www.energy.gov/eere/bioenergy/peer-review-2017

[2] U.S. Department of Energy, Bioenergy Technologies Office, 2015 Project Peer Review. Retrieved September 5, 2018, from https://www.energy.gov/eere/bioenergy/peer-review-2015

3. BUILDINGS

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

Residential and commercial buildings account for more than 40% of the nation's total energy demand and 70% of electricity use, resulting in an annual national energy bill totaling more than $380 billion [1, 2]. The U.S. Department of Energy's Building Technologies Office (BTO) (http://energy.gov/eere/buildings) is working in partnership with industry, academia, national laboratories, and other stakeholders to develop innovative, cost-effective energy saving technologies that could lead to a significant reduction in building energy consumption and enable sophisticated interactions between buildings and the power grid. BTO's goal is to reduce aggregate building energy use intensity by 45% by 2030, relative to the consumption of 2010 energy-efficient technologies. The rapid development of next-generation building technologies are vital to advance building systems and components that are cost-competitive in the market, to meet BTO's building energy use reduction goals, and lead to the creation of new business and industries. Moreover, by cutting the energy use of U.S. buildings by 20%, the American people could save approximately $80 billion annually on energy bills. And, money saved on energy costs flows to other sectors of the economy, which can lead to the creation of new jobs.

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for cost and/or performance improvements that are tied to clearly defined baseline and/or state of the art products or practices;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include an energy savings impact and/or impact on building-to-grid interaction as well as a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or experimental data.

Grant applications are sought in the following subtopics:

a. Next Generation Residential Air Handlers

According to ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers), an air handler, or air handling unit (AHU), is a Heating, Ventilation and Air-conditioning (HVAC) device that regulates and circulates air. BTO seeks to accelerate the development of the next generation Heating, Ventilation, Air-conditioning, and Refrigeration (HVAC&R), water heating and appliance technologies. HVAC&R technologies consume more than half of the total energy used in U.S. residential and commercial buildings [1]. HVAC alone is the largest energy end-use for U.S. buildings, consuming approximately 40% (15.5 Quads) of total energy in 2015. BTO has published several reports on the energy savings potential and RD&D Opportunities for both

Residential and Commercial Building HVAC Systems [2]. These reports document energy efficiency improvements in residential HVAC systems but show a lack of improvement in residential AHUs which have mostly stayed the same in shape, form, utility and efficiency. These reports highlight some of the emerging technologies that could be used in future air handlers. BTO is seeking new technologies like those highlighted in the BTO reports that can radically enable a transformative change in the design, manufacturability, maintenance/service, performance and energy savings from these next generation residential AHUs.

Today's residential air handlers used in central air conditioners and heat pumps systems typically look like large rectangular metal box and have for several decades. These air handlers physically connect to a home's ventilation system that distributes the conditioned air through the home with the responsibility of delivering comfort to its residents. These units are manufactured at a factory and final installation is done onsite by joining these components together and mating them to a building's duct system. Most residential air handlers include several major components including a blower (with an electric motor), an evaporator/condenser coil (heat exchanger) if a heat pump system, a furnace section if using natural gas to heat a home, and an evaporator coil for cooling if it is also an air conditioning system. Today these major components are optimized as independent components. A transformative change in air handler design will require that these components instead be optimized as a system.

BTO is seeking to develop the next generation of air handlers that are more than just better motor designs but also new system configuration based on advanced computational fluid dynamics (CFD) modelling that addresses the problem holistically (e.g. relationship of fans with other subcomponents, etc.), and enable the next generation of air handlers and of residential HVAC technology overall. The focus is on innovative solutions that can reduce the energy consumption of an air handler or AHU by a minimum of 25%, enhance the overall performance of the HVAC system greater than 5% (heating and/or cooling modes), and enable potential new system configurations and heat exchanger designs. These designs and solutions also include natural gas or fuel-fired solutions.

Most of these system's energy efficiency measures utilize a seasonal energy efficiency ratio (SEER in British thermal units per Watt-hour (Btu/Wh)), and the heating seasonal performance factor (HSPF in British thermal units per Watt-hour (Btu/W-h)). For this solicitation, these metrics should be used to justify all system energy efficiency claims. Given the wide range of units and sizes in the field, the applicant is required to pick a representative unit as the baseline state-of-the-art (SOA) unit and make all efficiency and performance claims based on that representative unit. Please justify the SOA unit and why it makes sense for your claims and the rationale behind its choice. While proposals are sought that focuses on residential air handlers, it is expected that some of these innovations could potential impact commercial AHUs as well. Applicants should capture these benefits and others if relevant.

Given the wide range of air handlers suitable for this subtopic, specific cost targets are not defined but should be cost neutral for the overall system design. However, applications should still report out the expected costs of the proposed system configuration, providing analysis to support all claims made. Applications must clearly state how the following targets will be met:

Next Generation Residential Air Handlers Targets	
Energy Efficiency	≥ 25% decrease in the energy consumption of an air handler or AHU ***and*** enhance the overall energy efficiency performance of the HVAC system ≥ 5% (heating and/or cooling modes)
Physical size	≤ 10% greater than state-of-the-art designs

Required cleaning intervals, or difficulty of cleaning, to maintain as-new performance	Little to no increase as compared to state-of-the-art designs, should improve system reliability
Susceptibility to damage or corrosion or performance degradation during manufacture, assembly, transportation, installation, or use	Little to no increase as compared to state-of-the-art designs for relevant applications
First Cost, system	No increase as compared to state-of-the-art system designs

Questions – Contact: Antonio M Bouza, antonio.bouza@ee.doe.gov

b. Novel Materials and Processes for Solid-State Lighting

There are numerous fundamental advancements of materials and process that are applicable to energy saving technologies of interest to the DOE that address high priority research needs such as energy storage, critical materials usage, efficient manufacturing, etc. Within EERE's Building Technologies Office (BTO), there are few other opportunities capable of achieving the remarkable energy saving potential promised by solid-state lighting (SSL) [1]. Today, SSL has begun to transform the general illumination landscape in a very significant and energy efficient manner, it is believed that only about 10% of the total energy conserving potential of SSL has been realized using currently available technologies. To achieve the goal of reducing domestic energy consumption of general illumination 50% or more through SSL, many innovative and technology breakthroughs are required in manufacturing processes, control systems, device architectures and constituent materials that are the subject focus of this subtopic [2]. Due to the tremendous breadth of the materials advancements required throughout the SSL landscape, this broad subtopic is described in three more narrow categories of novel materials needs or areas of interest. Only proposals that address these specific materials-related opportunities will be considered here.

Inorganic Light Emitting Diode (LED) Materials:

Considerable research and materials development has been applied towards overcoming the well-known droop in III-Nitride Light-Emitting Diode (LED) efficiency with longer wavelengths particularly in the green and amber wavelength regimes [3]. Often referred to as the "Green-Gap", BTO has systematically advanced the basic understanding of the fundamental mechanisms that dictate efficiency and droop by sponsoring early-stage research in this area over the past decade. The result has been a more comprehensive scientific understanding of the fundamental mechanisms but there remains a need for early-stage R&D to distill this knowledge to advance new and novel emitter materials and the processes used to efficiently and cost effectively manufacture them with reduced droop performance and spectral characteristics suited for general lighting applications.

Another area that has received investment by BTO is high-efficiency wavelength conversion materials and processes commonly referred to as downconverters. While most materials development has been focused on production of warm-white LEDs using existing Yttrium Aluminum Garnet (YAG)-based phosphors, other promising wavelength conversion materials and process have been developed recently including those that do not depend on critical materials such as Rare Earth Elements. Other examples include nanocrystals [4] and quantum dots [5] made with a variety of constituent materials. While promising, many of these candidate solutions still have challenges with poor thermal stability and non-uniform performance over long lifetimes. They also suffer from and high cost to manufacture or incorporate into device designs that are competitive and compatible with LED architectures that are widely used in high brightness lighting applications today. Thus, there remains a considerable opportunity for government sponsored research in alternative

downconversion solutions that meet the quantum yield, thermal stability, spectral performance, color consistency and optical flux saturation requirements with a new and potentially simpler manufacturing process.

Organic Light Emitting Diode Materials:

Organic Light Emitting Diode (OLED) efficiency is limited by many factors that require breakthroughs in constituent materials. Among the most significant materials and manufacturing process related needs are 1) high efficiency yet stable blue emitter materials, 2) high performance electrically conductive layers with superior visible light transmission properties and 3) device encapsulating or integrated substrate materials. Considerable research has already been completed in each of these areas with varying levels of success [4], Many of these new and novel materials advancements have been proven in laboratory experiments but have not met the simultaneous requirements of long lifetime, inexpensive manufacture and significant performance advancement. Innovative and novel solutions to this significant materials and process challenges are welcome in this area.

An important example of a novel materials need is conductive materials of advanced composition and design that perform multiple functions such as being highly transparent and electrically conductive. In contemporary OLEDs, efficient operation depends on superior charge introduction into various photonic layers yet whose optical transmission at wavelengths of practical value is simultaneously very high. These contradictory performance requirements are typically satisfied using Transparent Conducting Oxides (TCOs). Indium Tin Oxide (ITO) possessing an In:Sn atomic ratio of about 10:1, is the most common TCO coating used to manufacture OLED anodes in generic bottom-up deposited layer device designs. ITO is not, however, an ideal anode material for high efficiency OLEDs [4] it has: inappropriate work function, difficulty in creating desired patterns, poor thermal stability, integration and bending on flexible substrates. It also requires high quality Indium and must be processed at high temperatures. All these factors limit the high speed manufacture of integrated ITO substrates. While considerable research towards identification of alternative materials or structures for OLED anodes has been completed to date [4], there appears to be only limited commercial success. Therefore, in addition to proposed novel and unproven materials solutions to this challenge, advancement of known alternatives or processes are welcome in this area.

Optical Materials for High Efficiency Luminaires:

By their very definition, all high efficiency SSL technologies used in buildings must operate best within the visible portion of the electromagnetic spectrum. This creates special encapsulation or packaging challenges for both LED and OLED designs. At the device or light engine level, new materials and encapsulation methodologies must manage the refraction index to improve light extraction from these devices. New materials or alternative to conventional materials such as silicone composites, glass or polymers that are both stable and inexpensive are needed. This area includes the development of new and novel optical materials or matrices applicable to either LEDs or OLEDs and may be intended for either internal or external extraction efficiency improvement. Viable candidate approaches may incorporate other constituent materials such as downconverters for example, along with a proposed optical advancement that is novel or innovative.

Luminaires intended for use with SSL sources are typically designed based on their older counterparts that used a legacy lighting technology such as linear or compact fluorescent lamps. This common practice, while being easy and inexpensive to implement, has limited the market penetration of efficient luminaires for a variety of reasons. Arguably, the most significant is the limited availability of inexpensive, lightweight and

easy to manufacture optical materials that manage either the directional distribution of light from an LED or the diffuse light produced from an OLED better than the traditional material used with legacy lamp types. Materials that control light efficiently produced within the luminaire or to create beam profiles that are more easily and efficiently controlled are needed. Novel materials and optical designs that meet these performance challenges at competitive manufacturing costs and complexity are sought under this subtopic. Viable proposals to this subtopic may include integration of other functionality such as variable beam profiles, downconverters or methods used to manufacture them.

Summary:

Irrespective of the technical approach proposed to meet one or more of the above areas of interest, all successful proposals must demonstrate that the enabling research completed under this effort will succeed in producing the predicted performance advancement and reduction of technical risk required to move to successive stages of research. The proposed Phase I effort should be designed to retire significant technical risk and make proof of principle of the proposed approach. Phase II may continue to develop the approach but the fundamental question of penultimate price and performance of the proposed innovation should be well documented and clear in the Phase II proposal. The primarily benefit of the research proposed under this topic must be aligned with the price and performance goals described in the SSL Research and Development Plan [2].

Questions – contact James R. Brodrick, james.brodrick@ee.doe.gov

c. Automated Point Mapping for Commercial Buildings

One of the major barriers to the implementation of advanced data analytics (e.g., automated fault detection and diagnostics or AFDD) and controls software can be the laborious and expensive process of tagging and mapping individual points that correspond to sensors, actuators, and controllers located throughout a building. This long process limits the affordability of emerging analytics engines or software applications under development for optimizing building energy management, and ultimately, BTO's programmatic energy savings performance goals achieved through innovations in sensor and control technologies [1].

The challenge is especially pronounced for large commercial buildings due to the large number of points involved. Assuming one minute for identifying and commissioning each point, for example, should require 833.3 labor hours for a building consisting of 50,000 points [2]. Retrofit applications become even more complex due to inconsistent, mislabeled, or customized labeling of points associated with previously installed building automation systems (BAS) from different vendors, manufacturers, and installers. Furthermore, standardized point names do not include all metadata or descriptive information about a point (e.g., sensor placement location) necessary for mapping. Manual assignment of semantics or meaning to distinguish points is also time-consuming and subject to error. Standardized protocols (e.g., BACnet [3], LONWorks) to enable communications and automate the detection and identification process, consistent and harmonized naming conventions, semantic data models, and taxonomies or schema (e.g., Project Haystack [4], Building Information Models, Ontologies) are necessary and in development. Limitations exist in terms of completeness, including the ability to capture uncertainty [5, 6]. This is being addressed through techniques to automate the conversion of data from existing buildings [7, 8], as well as the development of a schema that includes an open reference implementation standard for evaluation of its effectiveness [9, 10]. Solutions are also being developed using machine learning to reduce the manual mapping process by automatically inferring names and data through statistical models that exploit patterns or correlations of points [11, 12, 13, 14, 15].

Leveraging these advancements, BTO is specifically interested in innovative solutions to remaining technical issues for point identification that are not being currently addressed in the approaches described, such as identification of errors in existing/new point names, identification of physical location of points, and any other issues not mentioned above.

Questions – Contact: Marina Sofos, marina.sofos@ee.doe.gov

d. Complementing Building Energy Modeling (BEM) with Non-Energy Analyses

Whole-building energy modeling is just one type of analysis that informs building energy efficiency projects such as design, operation, green certification, and code and program development and implementation. Other types of analyses include life-cycle analysis, daylighting, indoor and outdoor environmental quality and thermal comfort, urban microclimate, cost and other project or building related financial metrics, resiliency, and others. These analyses can often leverage data that is available for—or produced by—whole-building energy analysis. Some can, in turn, inform or enhance whole-building energy analysis.

BTO is seeking proposals for methods and tools that complement whole-building energy analysis and leverages energy analysis, its inputs, outputs or both to drive complementary analyses. Proposals may use open-source BTO-funded tools such as EnergyPlus and OpenStudio, but are not required to do so. Proposals may also leverage BTO-funded data repositories such as the Building Performance Database (BPD) and the Standard Energy Efficiency Platform (SEED), but are not required to do so. Where applicable, proposals are encouraged to use open data exchange schema such as BuildingSync, HPXML, and CityGML.

Questions – Contact: Amir Roth, amir.roth@ee.doe.gov

References:

[1] U.S. Energy Information Administration. Natural Gas Summary from 2012 – 2017. Washington, DC: U.S. Department of Energy, Release date: July 31, 2018. Accessed August 30, 2018: https://www.eia.gov/dnav/ng/ng_sum_lsum_dcu_nus_a.htm

[2] U.S. Energy Information Administration. Electric Power Monthly with Data for December 2016. Washington, DC: U.S. Department of Energy, February 2017. https://www.eia.gov/electricity/monthly/archive/february2017.pdf

Subtopic a) References:

[1] U.S. Energy Information Administration. Annual Energy Outlook 2014 with Projections to 2040. DOE/EIA-0383(2014). Washington, DC: U.S. Energy Information Administration, 2014.

[2] http://www1.eere.energy.gov/buildings/pdfs/residential_hvac_research_opportunities.pdf & http://www1.eere.energy.gov/buildings/pdfs/commercial_hvac_research_opportunities.pdf

Subtopic b) References:

[1] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2017, SSL Forecast Report, (https://www.energy.gov/eere/ssl/ssl-forecast-report)
[2] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Solid-State Lighting 2017 Research & Development Plan, (https://www.energy.gov/eere/ssl/downloads/solid-state-lighting-2017-rd-plan-suggested-research-topics)
[3] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2018, LED R&D Projects (https://www.energy.gov/eere/ssl/listings/led-rd-projects) and OLED R&D Projects (https://www.energy.gov/eere/ssl/listings/oled-rd-projects)
[4] Y. Shirasaki et al., "Emergence of colloidal quantum-dot light-emitting technologies," Nature Photonics 7, 13 (2013).
[5] Palomaki, Peter, "Quantum Dot Downconverters for SSL", DOE SSL R&D Workshop January 29-31, 2018, Nashville, TN, https://www.energy.gov/sites/prod/files/2018/02/f48/palomaki_qd-downconverters_nashville18_0.pdf

Subtopic c) References:

[1] Sofos, M., Langevin, J.T. (2018). Laying Down the Foundation: An R&D Roadmap for Energy Savings through Advancements in Smart Buildings Technologies," 2018 ACEEE Summer Study on Energy Efficiency in Buildings.
[2] Park, Y. (2012). Point Naming Standards: A Necessary Evil for Building Information Integration. ISA Automation Week: Control Performance, pp. 37-49. International Society of Automation, Research Triangle Park, NC.
[3] http://www.bacnet.org
[4] https://project-haystack.org
[5] Bhattacharya, A. A., Ploennigs, J., Culler, D. (2015). "Short Paper: Analyzing Metadata Schemas for Buildings – The Good, The Bad, and the Ugly," BuildSys '15.
[6] Schumann, A. et al., (2014). "Toward Automating the Deployment of Energy Savings Approaches in Buildings," BuildSys.
[7] Balaji, B., et.al., (2015). "Organizing large deployment of sensors to create reusable applications for buildings," BuildSys '15, 13-22.
[8] Bhattacharya, A. A., Hong, D., Culler, D., Ortiz, J., Whitehouse, K., Wu, E. (2015). "Automated metadata construction to support portable building applications." BuildSys '15, 3-12.
[9] http://brickschema.org
[10] Balaji, B., et al., (2016). "Brick: Towards a Unified Metadata Schema For Buildings," BuildSys '16.
[11] Schumann, A. et al., (2014). "Toward Automating the Deployment of Energy Savings Approaches in Buildings," BuildSys.
[12] Hong, D., Wang, H., Ortiz, J., Whitehouse, K., (2015). "The building adapter: Towards quickly applying building analytics at scale." BuildSys '15, 123-132.
[13] Ortiz, J., Dezhi, H., Whitehouse, K., Culler, D. (2013). "Towards automatic spatial verification of sensor placement in buildings," Proceedings fo the 5th ACM Workshop on Embedded Systems for Energy-Efficient Buildings.
[14] Koc, M., Akinci, B., Berges, M. (2014). "Comparison of linear correlation and statistical dependency measure for inferring spatial relation of temperature sensors in buildings," BuildSys '14.
[15] Gao, J., Ploennings, J., Berges, M. (2015). "A data-driven meta-data inference framework for building automation systems." BuildSys '15, 23-32.

4. FUEL CELLS

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount: (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Fuel Cell Technologies Office (FCTO)[1] is a key component of the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) portfolio. The central mission of FCTO is to stimulate the U.S. economy and global competitiveness by reducing dependence on foreign oil imports and establishing a domestic power and fuel industry using efficient, reliable clean energy technologies through early stage research and technology development. To achieve this goal, FCTO invests in early-stage, innovative technologies that show promise in harnessing American energy resources safely and efficiently. Fuel cells can address our critical energy challenges in all sectors - commercial, residential, industrial, and transportation."

Fuel cell electric vehicles (FCEVs) using hydrogen can achieve significantly higher efficiencies than combustion engines resulting in overall less energy use. Hydrogen can be produced from diverse domestic resources, such as natural gas, oil, coal, and biomass, as well as from renewables using methods such as direct or indirect water splitting. In addition to transportation applications, hydrogen and fuel cell technologies can also serve stationary applications—i.e. providing responsive back-up power and other electric and fuel distribution services improving energy security and reliability. Thus, fuel cell and hydrogen technologies enable American energy dominance by safely and efficiently harnessing domestic resources.

FCTO addresses key technical challenges for both fuel cells and hydrogen fuels (i.e., hydrogen production, delivery and storage). Light duty FCEVs are an emerging application for fuel cells that has earned substantial commercial and government interest worldwide due to the superior efficiencies, reductions in petroleum consumption, and reductions in criteria pollutants possible with fuel cells. Recent analyses project that, if DOE cost targets for FCEVs are met, U.S. petroleum consumption can be reduced by over one million barrels per day3. FCEVs reduce petroleum consumption by about 95% in comparison to conventional light duty vehicles when the hydrogen is produced from natural gas[2]. The areas identified in this topic will enable progress toward commercializing light duty FCEVs.

Grant applications are sought in the following subtopic. Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

a. Fuel Cell Membranes and Ionomers

Polymer electrolyte membrane (PEM) fuel cells are a leading candidate to power zero emission vehicles, with several major automakers already in the early stages of commercializing fuel cell vehicles powered by PEM fuel cells. PEM fuel cells are also of interest for stationary power applications, including primary power,

backup power, and combined heat and power. Commercial PEM technology typically is based on perfluorosulfonic acid (PFSA) ionomers, but these ionomer materials are expensive, particularly at the low volumes that will be needed for initial commercialization. Non-PFSA PEMs, including those based on hydrocarbon membranes, represent a lower-cost alternative, but government sponsored R&D is needed to improve non-PFSA's relatively low performance and durability.

Development of novel hydrocarbon and other ionomers, including non-PFSA PEMs suitable for application in fuel cells is solicited through this subtopic. Novel PEMs developed through this subtopic should have all properties and characteristics required for application in PEM fuel cells for transportation applications, including:

- High proton conductivity in a range of temperature and humidity conditions
- Good film forming properties enabling formation of thin (<10 μm) uniform membranes
- Low swelling and low solubility in liquid water
- Low creep under a range of stress, temperature, and humidity conditions
- Low permeability to gases including H2, O2, and N2
- Chemical and mechanical durability sufficient to pass the accelerated stress tests

The goal of any proposed work under this subtopic should be to produce a PEM using an affordable and durable ionomer that can meet or exceed all of the 2020 technical targets simultaneously in the table below. PEM technology proposed for this subtopic should be based on non-PFSA ionomers, but may include reinforcements or other additives.

Membrane samples should be tested at an independent laboratory at the end of each phase. Phase I should include measurement of chemical and physical properties to demonstrate feasibility of concurrently meeting or exceeding the targets below related to these parameters, while Phase II should address long term durability and development of manufacturing processes to meet the cost targets.

Technical Targets: Fuel Cell Membranes for Transportation Applications Excerpted from [1]

Characteristic	Units	2020 Targets
Maximum oxygen crossover	mA / cm²	2
Maximum hydrogen crossover	mA / cm²	2
Area specific proton resistance at:		
Maximum operating temperature and water partial pressures from 40–80 kPa	Ohm cm²	0.02
80°C and water partial pressures from 25–45 kPa	Ohm cm²	0.02
30°C and water partial pressures up to 4 kPa	Ohm cm²	0.03
-20°C	Ohm cm²	0.2
Maximum operating temperature	°C	120
Minimum electrical resistance	Ohm cm²	1,000

Cost[d]	$ / m^2	20
Durability		
Mechanical	Cycles until >15 mA/cm^2 H_2 crossover	20,000
Chemical	Hours until >15 mA/cm^2 crossover or >20% loss in OCV	>500
Combined chemical/mechanical	Cycles until >15 mA/cm^2 crossover or >20% loss in OCV	20,000

Questions – Contact: Donna Ho, Donna.Ho@ee.doe.gov

b. Nozzles for High-Pressure, Low-temperature Gas Fills

The cost and reliability of nozzles for dispensing of hydrogen into light duty fuel cell vehicles is currently a critical barrier to the viability of hydrogen infrastructure. Hydrogen dispensers currently account for 35% of unscheduled maintenance events at stations, and design flaws are one of the most common causes of nozzles losing functionality [1]. Innovations in manufacturing techniques for nozzles could reduce their capital costs, improve the reliability of fueling stations, reduce leakage of hydrogen, and ensure domestic leadership in the emerging area of hydrogen infrastructure. Domestic stakeholders in related industries, such as suppliers of compressed natural gas (CNG) components, may be particularly well-positioned to leverage existing technologies in R&D on hydrogen fueling.

Proposals are sought for the development of hydrogen fueling nozzles for use at high-throughput stations (80% utilization) for light-duty vehicles, using filling methods compliant with the Society of Automotive Engineers (SAE) J2601 fueling protocol [2]. Nozzles should be capable of incorporating station-to-vehicle communications technologies that are currently in use (e.g. infrared communication between the vehicle and the fueling station), or being considered for use in future stations (e.g. wireless communication). Phase I of the proposed work may include evaluation of advanced materials, manufacturing techniques (e.g. additive manufacturing), or designs for nozzles, along with down-selection of one concept for further evaluation. Phase II may include development of a nozzle prototype, experimental verification of prototype performance, and technoeconomic analysis of nozzle cost. Nozzle concepts proposed must be capable of: 1) hydrogen fills per flow rates, temperatures, and pressures specified in the SAE J2061 protocol, 2) a service life of at least 25,550 fills/year for 10 years, and 3) a capital cost of $7,000 or less for nozzles, not including the cost of communications components.

Questions – Contact: Neha Rustagi, Neha.Rustagi@ee.doe.gov

c. Active Low Cost Thin Film Hydrogen Sensors

Hydrogen gas is used in a variety of sectors today (e.g. oil refining, coal power plants, fueling stations for fuel cell vehicles), and safe operation requires the ability to rapidly detect and contain leaks. Approaches currently used for leak detection include monitoring of drops in pressure, along with use of thin films with chemical indicators that change color in the presence of hydrogen. While current technologies can detect leaks from point sources (e.g. due to fittings or failure of seals), most cannot also autonomously communicate, in rapid

dynamic response times, with a facility to notify its operator of the leak. Additionally, their performance is challenged in outdoor environments, where heightened sensitivity is required due to the potential for hydrogen to diffuse widely.

This subtopic seeks R&D on enabling viable leak detection technologies including integration with communications technologies that notify a system operator when a leak occurs. Phase I funding is for proof-of-concept R&D and testing of communications concepts (e.g. radio frequency identification distributed networks) that may be integrated with existing leak detectors. Phase II funding would enhance the sensitivity of the leak detection technologies to improve their performance in outdoor environments while meeting affordability targets. Concepts proposed should be resilient when exposed to high concentrations of hydrogen, compatible with a large assortment of operating systems, and capable of communication with a facility within sub seconds.

Questions – Contact: Laura Hill, Laura.hill@ee.doe.gov

d. Smart Sensors for Structural Health Monitoring (SHM) of Composite Overwrapped Pressure Vessels (COPVs) of On-board Hydrogen Storage for Fuel Cell Electric Vehicles (FCEVs)

Fuel Cell Electric Vehicles (FCEVs) are now commercially available in certain parts of the U.S. and around the world with many meeting the initial DOE goal of a 300 mile driving range using carbon fiber composite overwrapped pressure vessels (COPV) rated for 700 bar compressed hydrogen service. [1] In addition, there are now approximately 35 retail hydrogen refueling stations open to the public in California with several more expected to come online soon.[2]

To harness American energy resources safely and efficiently and to improve the safety of the high-pressure COPVs, there is interest in developing health monitoring sensors that can provide real-time indication of potential damage or degradation of the composite overwraps. Real-time sensors could also eventually lead to reduction in the manufacturing overdesign of the COPVs and thus lower overall cost. Damage to the composite overwraps can result from pressure loads over time, environmental induced degradation in operation, and accidental mechanical impacts. COPVs can be subjected to a broad range of damage mechanisms, either usual (e.g., cycling) or accidental (e.g., car accident, fall or impact during transport, handling, installation, etc.). Potential damage mechanisms can include fiber breakage, delamination and matrix cracking. R&D is needed to improve characterization of COPV damage resulting from a mechanical impact (e.g. from a projectile or drop), its evolution under typical in-service loadings (monotonic pressurization, filling/emptying cycles, etc.), and the corresponding loss of performance. This is partially due to there being only a few studies addressing the consequence of impact on the residual lifetime of composite materials obtained by filament winding. In addition a surface impact could create damage in the thickness of the composite and can even damage the liner.[3] Such sensors could also be utilized for COPVs used in other applications, such as onboard compressed natural gas (CNG) vehicles and self-contained breathing apparatuses (SCBA) used by first responders.

To ensure of the structural health of the COPVs to prevent unexpected failure, online monitoring of the tank would be of value. Applications are sought to perform early stage research, development and demonstration (RD&D) of techniques/instruments/technologies that can monitor vital aspect of COPVs. The monitoring needs to be imbedded/integrated into the COPV and can monitor COPV features passive or actively.

Some potential areas of interests include, but are not limited to:

- Non-Destructive Evaluation (NDE) techniques for continuously monitoring structural health for improved fatigue life, stress rupture, and damage tolerance.
- Gauges for sensing and recording/reporting abnormalities in stress, strain, localized pressure and temperature rise, cycle counting, and scheduled maintenance.
- Sensors for detecting permeation, leakage, pressure decay, humidity, and localized heat transfer.
- Massive data collection effort through network connected SHM sensors to drive reduction in statutory overdesign (e.g. reduce safety factor and/or necessary manufacturing overdesign)

Questions – Contact: Bahman Habibzadeh, bahman.habibzadeh@ee.doe.gov

e. Innovative Concepts for Hydrogen Conversion to Liquid Hydrocarbon Fuels

Applications are sought for innovative catalyst and reactor designs for synthesis of liquid hydrocarbons from captured CO2 and hydrogen produced from renewable energy sources.

One promising pathway for utilization of stranded renewable energy resources is synthesis of renewable liquid hydrocarbon fuels from captured CO2 and H2 produced through water splitting utilizing renewable energy. These liquid hydrocarbons are compatible with the existing fuel infrastructure and can provide means for inexpensive transportation, storage, and distribution of renewable energy, ultimately creating a sustainable carbon cycle for energy production and utilization.

Several commercial processes can produce liquid hydrocarbons from coal or natural gas, (e.g. Fischer-Tropsch, Methanol, DME synthesis) by first converting the fuel into syngas (a mixture of CO and H2) followed by liquid hydrocarbon synthesis step. Presently, these processes are generally carried out in large scale reactors under continuous operating conditions. Several important modifications to the existing processes will need to be implemented in order to make them compatible with liquid hydrocarbon production from captured CO2 and renewable H2 and adapted to utilizing renewable energy sources.

Firstly, the processes and catalysts have to be modified to operate with CO2 instead of CO in the feed. Conversion of CO2 into CO in a reverse Water-Gas-Shift (RWGS) process is one option. Direct synthesis from CO2 and H2 is another, more direct approach. Secondly, the hydrocarbon synthesis processes have to be adapted to operation with inherently intermittent and distributed renewable energy sources, such as wind or solar. This will require operating smaller production units that are capable of frequent start/stop and production ramping up and down [1,2,3].

Questions – Contact: Eric Miller, eric.miller@ee.doe.gov

General References:

[1] Fuel Cell Technologies Office (FCTO) http://energy.gov/eere/fuelcells/fuel-cell-technologies-office
[2] Nguyen, T. and Ward, J., 2016, Life-Cycle Greenhouse Gas Emissions and Petroleum Use for Current Cars, U.S. Department of Energy, Fuel Cell Technologies Office, p. 5.
https://www.hydrogen.energy.gov/pdfs/16004_life-cycle_ghg_oil_use_cars.pdf

[3] Andress, D., Nguyen, T., and Morrison, G., 2016, GHG Emissions and Petroleum Use Reduction from Fuel Cell Deployments, U.S. Department of Energy, Fuel Cell Technologies Office, p. 8. https://www.hydrogen.energy.gov/pdfs/16003_ghg_emissions_oil_use_reduction_from_fc.pdf

Subtopic a) References:

[1] Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan (Section 3.4 Fuel Cells): https://www.energy.gov/eere/fuelcells/downloads/fuel-cell-technologies-office-multi-year-research-development-and-22 Pages 3.4-20, 48, 49, and 50

Subtopic b) References:

[1] Sprick, S. et al (2018). "Next Generation Hydrogen Station Composite Data Products: All Stations (Retail and Non-Retail Combined)—Data through Quarter 4 of 2017." https://www.nrel.gov/docs/fy18osti/71644.pdf.
[2] https://www.sae.org/standards/content/j2601_201612/.

Subtopic d) References:

[1] http://www.fueleconomy.gov/feg/fcv_sbs.shtml
[2] http://cafcp.org/stationmap
[3] https://www.hysafe.info/wp-content/uploads/2017_papers/293.pdf

5. GEOTHERMAL

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount: (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

Geothermal energy is secure, reliable, flexible, and constant. It continues to be one of America's best choices for low-cost renewable energy in power generation and in direct-use applications for heating and cooling of American homes and businesses. The Geothermal Technologies Office (GTO) focuses on applied research, development, and innovations that will improve the competitiveness of geothermal energy and support the continued expansion of the geothermal industry across the U.S. [1]. Currently, the U.S. has 3.8 gigawatts electric (GWe) of installed geothermal capacity, while advances in technologies such as Enhanced Geothermal Systems (EGS) could enable access and deployment of more than 100 GWe of new geothermal capacity. Consistent with the administration's R&D priority in American Energy Dominance, this topic seeks to invest in early-stage, innovative technologies that show promise in harnessing new domestic geothermal resources that provide clean, affordable, and reliable energy. Because deploying additional baseload geothermal energy will contribute to grid reliability and resilience as well as national security, this topic supports the Acting Assistant Secretary for EERE's grid integration priority.

A Phase I application should focus on proof of concept and bench scale testing that are scalable to a subsequent Phase II prototype development. Applications must be responsive to the following subtopic; any application outside of this area will not be considered.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;

- Include projections for price and/or performance improvements that are tied to a baseline (i.e. roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopic:

a. Improved downhole telemetry for geothermal drilling

In this topic, GTO solicits innovative research and development projects to enable improved downhole telemetry for geothermal drilling operations. Drilling operations can be up to 50% of the cost of the development for a geothermal project [2]. Improving downhole telemetry during drilling can reducing drilling costs and risks that would help spur the geothermal industry to expand capacity in the near-term. The International Association of Drilling Contractors defines downhole telemetry as "Signals transmitted in real-time (while drilling) from an instrument located near the bottom of the drill string to a receiving monitor on the surface (a surface-readout)" [3]. Enabling real-time data transfer from tools and sensors in the bottom-hole assembly (BHA) to the drill operator can lead to improved rates of penetration (ROP), reduced non-drilling time (NDT), and increased safety through real-time wellbore stability monitoring. Additionally, a better understanding of well depth and location and increased control for directional drilling could lead to reduced operational and stimulation costs. Current practices for downhole telemetry include wireline embedded within the drill-pipe, electromagnetic (EM) signals passed through the formation, acoustic signals carried over the drill-pipe, and sonic signals carried the drilling fluid or "mud pulse." Of these options, wireline telemetry is often not feasible and mud pulse, acoustic, and EM have limitations on bit transmission rates and data quality [4]. Additionally, geothermal wells can be drilled without a drilling fluid (called "air drilling"), which eliminates the option of mud pulse telemetry. This topic is seeking innovations that go beyond these current practices seeking to improving bit transmission rate, reducing signal attenuation, and/or reducing costs by at least 25% over current state-of-the-art. Responses to this topic must address downhole telemetry issues specific to geothermal drilling, which can include, but are not limited to: higher temperatures (>250°C), drilling through crystalline formations with little to no porosity, and air drilling.

While the high temperatures in geothermal wells often cause issues with standard electronics associated with downhole telemetry, this topic is not seeking innovations solely into new high-temperature electronics. Novel wide-bandgap semiconductors may only be proposed as a component to an otherwise innovative downhole telemetry system, not as the proposed innovation.

This topic is solely focused on downhole telemetry during geothermal drilling operations; innovation into other types of telemetry (such as long term well monitoring, fiber optic cables embedded in wellbores, etc.) will be deemed not responsive.

Questions – contact joshua.mengers@ee.doe.gov

References:

[1] Geothermal Technologies Office Website: https://energy.gov/eere/geothermal

[2] Tester et al., 2006, "The Future of Geothermal Energy, Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century"
https://www1.eere.energy.gov/geothermal/pdfs/future_geo_energy.pdf
[3] http://drillingmatters.iadc.org/glossary/downhole-telemetry/
[4] Almeida Jr. et al., 2015 "a Review of Telemetry Data Transmission in Unconventional Petroleum Environments Focused on Information Density and Reliability"
https://file.scirp.org/pdf/JSEA_2015090414401392.pdf

6. SOLAR

Maximum Phase I Award Amount: (b) (5)	**Maximum Phase II Award Amount:** (b) (5)
Accepting SBIR Phase I Applications: YES	**Accepting STTR Phase I Applications:** YES

The Solar Energy Technologies Office (SETO)[1] is the primary office within the U.S. Department of Energy (DOE) that funds innovations in solar power. The office is housed within the Office of Energy Efficiency and Renewable Energy (EERE). SETO supports early-stage research and development to improve the affordability, reliability, and performance of solar technologies on the grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use and storage of solar energy, and lower solar electricity costs.

In September 2017 the office announced that its goal to make solar electricity costs competitive with other generation sources by 2020, without subsidies, had been met three years ahead of schedule for utility-scale photovoltaic solar systems[2]. The office will continue to work to lower the cost of solar (photovoltaics and concentrated solar power) energy and has established a goal to halve the cost of solar energy by 2030[3]. With the dramatic reduction in the cost of solar, installations have soared, creating new challenges and opportunities for the electricity grid. To account for these changing needs, the office is also focusing on solar energy research and development efforts that help address the nation's critical energy challenges: grid reliability, resilience, and affordability.

Within this Funding Opportunity Announcement, SETO is releasing this Topic and joining the EERE Advanced Manufacturing Office in releasing Joint Topic 10 on "Innovation in solar module manufacturing processes and technologies".

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical and business milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are referenced to a benchmark;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

In this Topic, SETO seeks applications for the development of innovative and impactful technologies in the subtopics of:

a. TECHNOLOGY TRANSFER OPPORTUNITY: Real-Time Series Resistance Monitoring in Photovoltaic Systems

Sun Open Circuit Voltage (Suns-Voc) analysis provides a method to probe the hypothetical, series-resistance free, current-voltage (I-V) curve of a photovoltaic device. While historically Suns-Voc has been used for the analysis of photovoltaic cells under controlled laboratory conditions, recent work at NREL has extended the Suns-Voc methodology to develop automated Real-Time Series Resistance ("RTSR") monitoring capabilities for photovoltaic modules in the field. NREL's RTSR methodology is useful to passively detect common failure modes found in installed modules, including broken ribbons, failed solder bonds, or improperly joined junction/combiner box connections in modules and systems all under normal outdoor operation, by analysis of current and voltage information taken from the inverter. Early detection of these failure modes is critical for solar O&M providers in order to reduce potential fire risk, as well as to identify degraded, improperly installed, or otherwise underperforming modules in need of replacement. NREL is currently looking for partners to develop hardware and software related to the improved Suns-Voc techniques for commercial applications

National Renewable Energy Laboratory Information:
Licensing Information: National Renewable Energy Laboratory
Contact: Bill Hadley; bill.hadley@nrel.gov; (303) 275 3015
License type: Non-Exclusive
Patent Status: U.S. Patent Application Serial No. 15/564,357
Publication date:
Filing date:
http://appft1.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PG01&p=1&u=/netahtml/PTO/srchnum.html&r=1&f=G&l=50&s1=20180131322.PGNR.

Questions – contact solar.sbir@ee.doe.gov

b. TECHNOLOGY TRANSFER OPPORTUNITY: PV module Soiling Spectral Deposition Detector

Accumulation of dust, particles, and dirt on the surface of photovoltaic modules can cause a reduction in the intensity of light transmitted through the module cover and therefore in the amount of energy generated. Recent studies have shown that total power losses in Europe and the U.S. approach 7% annually due to soiling and are much worse (up to 70%) in other parts of the world. This has significant impact on the solar market; a flat 4% soiling loss affecting all PV capacity worldwide has been estimated to result in potentially over $1 Billion in lost revenue annually. While PV modules can be cleaned, the one-time cost for doing so is quite expensive: between $0.20-0.50 per module (or $5,000 for a 10 MW system). Thus, it is important to monitor soiling in order to plan for the most accurate cleaning schedule of a system; while uncleaned modules result in unnecessary revenue loss due to diminished energy generation, the cost of cleaning modules can be prohibitively expensive if ineffectively performed. There exists a need to determine the exact level of soiling present in an installed PV system so as to make educated decisions about when cleaning of the system is required. NREL has developed a prototype device which can detect the amount of soiling present throughout an installed PV system and correlate that soiling level with lost power generation. In this way, informed decisions about how and when to clean installed modules can be made. NREL is currently looking for a

partner to perform continued field-tests and optimization of the device in various real-world scenarios, environments, and weather conditions.

National Renewable Energy Laboratory Information:
Licensing Information: National Renewable Energy Laboratory
Contact: Bill Hadley; bill.hadley@nrel.gov; (303) 275 3015
License type: Non-Exclusive
Patent Status: U.S. Patent Application Serial Nos. 62/652,955 & 62/690,086
Publication date:
Filing date:

Questions – contact solar.sbir@ee.doe.gov

c. Storage technologies to enable low-cost dispatchable solar photovoltaic generation

One of the priorities of the SETO office is to support early-stage, innovative solar technologies that show promise in harnessing American energy resources safely and efficiently. In this topic, we are interested in exploring approaches that can provide opportunities for energy storage that is well suited to integration with solar photovoltaic technology, or optimizing energy use. SETO plans include collaboration with the U.S. Department of Energy Office of Electricity [1] to select and manage awards under this subtopic.

As solar electricity costs continue to decrease, the percentage of solar photovoltaic generation (both from distributed and utility-scale systems) in the U.S. increases. This opens up new challenges and opportunities for the development of novel technologies that can enable low-cost dispatchable solar PV generation that enables increased integration and operation flexibility and allow solar electricity to be better matched to demand.

In this subtopic, SETO is seeking innovative storage technologies that could be co-located with solar photovoltaic systems and are fully compatible with the characteristics of the typical output of a solar inverter (medium-low voltage, variable generation). Technologies proposed should leverage attributes specific to solar photovoltaic generation technologies while addressing current integration gaps and challenges. SETO is especially interested in novel thermal, mechanical or chemical storage technologies that can demonstrate clear non-incremental differentiation from the current state of the art.

Applications must include a basic cost-model analysis showing a path to be cost-competitive with current state of the art, and with the potential to increase the utilization of solar photovoltaic generation in the grid. Storage functionalities at any time scale will be considered (minutes, hours, days, seasonal). However, the application should clearly discuss which energy value stream this technology will target, if successful.

Applications will be considered non responsive and declined without external merit review if they describe a software-only solution or a solution based on existing battery technologies or if the technology is aimed at self-consumption optimization or the application does not demonstrate a clear innovation compared to current the state of the art.

Questions – contact solar.sbir@ee.doe.gov

d. Hardened solar system design and operation for recovery from extreme events

One of the priorities of the SETO office is to enhance the ability of solar energy technologies to contribute to grid reliability and resilience as well as national security, including but not limited to security and resilience of the Nation and its critical infrastructure.

Infrastructure systems, including the electrical grid and solar generation assets (both photovoltaic and concentrating solar power) are vulnerable to extreme weather and other disruptive events. Increased asset resilience presents opportunities to maximize operability, energy availability (along with communications, water...), and to minimize restoration costs following these occurrences.

In this subtopic, SETO is seeking innovative proposals to improve the ability of solar assets and systems to quickly recover in response to extreme events. Proposals may address specific component or system designs that passively (such as more structurally robust designs or configurations) or actively (such as array/tracker stow strategies or "hardened" components) improve survival and/or recovery time and minimize cost associated with extreme events.

Applications must include a basic cost-model analysis showing the cost/benefit of the proposed solution in comparison to current state of the art. Applications should also identify a possible case use by defining the time to recover the system fully functionalities, and provide substantiated estimates for the capabilities of the proposed approach.

Targets and metrics for hardened solar system performance could include (but are not limited to):

- Percent of system operable after extreme event (applications should specify type and intensity). Survivability at extreme wind loads (> 125 mph) is of particular interest;
- Time to full system operability after extreme event (restoration time);
- Reduction in system restoration cost following extreme event;
- Level of functionality without grid support following extreme event (islanding).

Applications will be considered non responsive and declined without external merit review if: the application does not demonstrate clear innovation compared to current the state of the art, particularly in regard to microgrid and/or islanding behaviors.

Questions – contact solar.sbir@ee.doe.gov

e. Rural solar

One of the goals of the SBIR/STTR programs is to encourage the participation of socially and economically disadvantaged persons in technology innovation with increasing geographic diversity of grant funding.

Small and medium-scale (non-utility) solar systems are mostly deployed in urban residential or commercial and industrial settings (we will refer to them as traditional locations within this subtopic). In this subtopic, SETO is seeking the development of solar photovoltaic products or system designs to enable and increase use of non-traditional installation locations when deploying small and medium-scale solar photovoltaic technologies. Such technological solutions could enable rural or economically challenged home or business owners, as well as small land holders to participate in the American solar economy and receive the associated benefits[1]. Proposed solutions should provide particular attention to safety. In addition, solutions should be designed for flexible

deployment on a variety of terrains or building types. SETO is particularly interested in technology innovation that would enable installation of solar systems on agricultural or multiuse land, including solutions that allow for complementary land use / value streams in a synergistic manner.

Applications should always identify possible use case(s) and provide substantiated estimates for the capabilities of their proposed system or technology. In addition, the Applications should demonstrate that the proposed technology is cost competitive (compared to other sources of electricity) in these non-traditional locations. In their commercialization plans, Applicants should include their strategy to enter new and potentially difficult markets outside of the areas that have seen significant solar deployments over the past 10 years.

Applications will be considered non responsive and declined without external merit review if within one of these areas:

- Undifferentiated products, incremental advances or duplicative products;
- Applications focusing exclusively on HVAC or water heating applications;
- Products or solutions for systems which do not tie to the electric grid (i.e. wholly off-grid applications, portable power, solar fuel);
- Software-only solutions.

Questions – contact solar.sbir@ee.doe.gov

f. Affordability, reliability, and performance of solar technologies on the grid

Fueling America's energy portfolio requires access to domestic sources of clean, affordable, and reliable energy. Unleashing these abundant energy resources will require investment in next-generation energy technologies to efficiently convert them into useful energy services.

In 2017, solar power generated almost 1.5% of the total annual electricity supply in the United States, and the Energy Information Administration projects that solar will grow to 5% of U.S. electricity by 2030[1]. Further, if the price of solar electricity and/or energy storage declines more rapidly than projected, that percentage could be even higher. But solar is more than just a source of affordable electricity; it also provides the potential to improve grid reliability and resilience, increase employment, create business opportunities, increase energy diversity, expand domestic manufacturing, and provide environmental benefits.

In this subtopic, SETO is seeking integrated solutions that can advance solar energy technologies by lowering cost[2] while facilitating the secure integration into the nation's energy grid. Applications should fall within one of these areas:

- Advanced Solar Systems Integration Technologies: responsive applications would advance the prediction, monitoring, and control of solar power production and distribution and the capabilities of solar power electronics;
- Concentrating Solar Thermal Power technologies: responsive applications would develop technologies that focus sunlight to generate and store high-temperature heat for electricity generation and other end uses;

- Photovoltaic technologies: responsive applications would improve photovoltaic system reliability, annual energy yield, reduce supply-chain capital expense, demonstrate performance of novel photovoltaic materials and components, and develop new photovoltaic materials.

SETO is particularly interested in applications developing:

- Technologies which can reduce the manufacturing costs of solar energy system components or sub-components to boost domestic energy manufacturing and increase U.S. manufacturing competiveness;
- Technologies which enhance the ability of solar energy systems to contribute to grid reliability, resiliency and security;
- Development and publication of replicable system designs for configurations that could be installed across comparable sites (e.g. homes or commercial buildings with similar roofing)
- Designs for photovoltaic modules and system configurations that anticipate updates in codes or safety requirements;
- Technologies to improve recyclability of photovoltaic materials and components;
- Technologies / solutions that reduce the balance of system component of the cost of a photovoltaic system.

Applications must include a clear assessment of the state of the art and how the proposed technology would represent a significant improvement, along with a basic cost-model analysis showing a path to becoming cost-competitive with current state of the art and the potential to increase the utilization of solar generation in the grid.

Applications will be considered non responsive and declined without external merit review if within one of these areas:

- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics);
- Applications that fall in any of the other subtopics listed in this funding opportunity announcement;
- Business plans or proofs-of-concept that do not include documentation supporting the necessity or benefit of the plan or concept. Competitive approaches in this application segment should be clearly defined in the application;
- Undifferentiated products, incremental advances or duplicative products;
- Projects lacking substantial impact from federal funds. This subtopic intends to fund projects where federal funds will provide a clear and measurable impact, (e.g. retiring risk sufficiently for follow-on investment or catalyzing development.) Projects that have sufficient monies and resources to be executed regardless of federal funds are not of interest;
- Applications focusing exclusively on HVAC or water heating applications;
- Products or solutions for systems which do not tie to the electric grid (i.e. wholly off-grid applications, portable power, solar fuel);
- Software to facilitate system design or system monitoring;
- Any software solution to improve customer acquisition processes.

This subtopic seeks to assist independent small businesses which can fully support themselves, continue to grow, and successfully bring a new technology into the market. This opportunity is not intended for creating a product, organization, service, or other entity or item which requires continued government support. This subtopic does not intend to fund work that has already received federal support for similar technology at the same technology readiness level.

Questions – contact solar.sbir@ee.doe.gov

References:

[1] https://energy.gov/solar-office
[2] https://www.energy.gov/articles/energy-department-announces-achievement-sunshot-goal-new-focus-solar-energy-office
[3] https://www.energy.gov/eere/solar/goals-solar-energy-technologies-office

Subtopic c) References:

[1] https://www.energy.gov/oe/office-electricity

Subtopic e) References:

[1] https://www.cooperative.com/content/public/maps/esri-solar-story-map/index.html

Subtopic f) References:

[1] U.S. Department of Energy, Energy Information Administration, International Energy Outlook 2017, DOE/EIA-0484 (2017)
[2] https://www.nrel.gov/docs/fy17osti/68105.pdf

7. VEHICLES

Maximum Phase I Award Amount: (b) (5)	**Maximum Phase II Award Amount:** (b) (5)
Accepting SBIR Phase I Applications: YES	**Accepting STTR Phase I Applications:** YES

Last year, vehicles transported 11 billion tons of freight, more than $32 billion worth of goods each day, and moved people more than 3 trillion vehicle-miles. The U.S. Department of Energy's Vehicle Technologies Office (VTO) provides low cost, secure, and clean energy technologies to move people and goods across America. VTO (https://www.energy.gov/eere/vehicles/vehicle-technologies-office) [1] focuses on reducing the cost and improving the performance of vehicle technologies that can reduce petroleum dependency, including advanced batteries, electric traction drive systems, lightweight materials, advanced combustion engines, and advanced fuels and lubricants. VTO supports the development and deployment of advanced vehicle technologies, including advances in electric vehicles, engine efficiency, and lightweight materials. Since 2008, the Department of Energy has helped reduced the costs of producing electric vehicle batteries by more than 75%. DOE has also pioneered improved combustion engines that have saved billions of gallons of petroleum fuel, while making diesel vehicles as clean as gasoline-fueled vehicles.

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;

- Include projections for price and/or performance improvements that are tied to a baseline (i.e. Multi-Year Program Plan (MYPP) or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data
- Applications that duplicate research already in progress will not be funded; all submissions therefore should clearly explain how the proposed work differs from other work in the field.

Grant applications are sought in the following subtopics:

a. Electric Drive Vehicle Batteries

Applications are sought to develop electrochemical energy storage technologies that support commercialization of micro, mild, and full HEVs, PHEVs, and EVs. Some specific improvements of interest include the following: new low-cost materials; alternatives or recycling technologies of energy storage critical materials defined at: https://www.energy.gov/policy/initiatives/department-energy-s-critical-materials-strategy [1]; high voltage and high temperature non-carbonate electrolytes; improvements in manufacturing processes – specifically the production of mixed metal oxide cathode materials through the elimination or optimization of the calcination step to reduce cost and improve throughput, speed, or yield; novel SEI stabilization techniques for silicon anodes; improved cell/pack design minimizing inactive material; significant improvement in specific energy (Wh/kg) or energy density (Wh/L); and improved safety. Applications must clearly demonstrate how they advance the current state of the art and meet the relevant performance metrics listed at www.uscar.org/guest/article_view.php?articles_id=85 [2].

When appropriate, the technology should be evaluated in accordance with applicable test procedures or recommended practices as published by the Department of Energy (DOE) and the U.S Advanced Battery Consortium (USABC). These test procedures can be found at www.uscar.org/guest/article_view.php?articles_id=86 [3]. Phase I feasibility studies must be evaluated in full cells (not half-cells) greater than 200mAh in size while Phase II technologies should be demonstrated in full cells greater than 2Ah. Applications will be deemed non-responsive if the proposed technology is high cost; requires substantial infrastructure investments or industry standardization to be commercially viable; and/or cannot accept high power recharge pulses from regenerative breaking or has other characteristics that prohibit market penetration. Applications deemed to be duplicative of research that is already in progress or similar to applications already reviewed this year will not be funded; therefore, all submissions should clearly explain how the proposed work differs from other work in the field.

Questions – contact Samm Gillard, Samuel.Gillard@ee.doe.gov

b. SiC devices suitable for Electric Vehicle Extreme Fast Chargers

The push to reduce charging time through Extreme Fast Charging (XFCs) needed for Battery Electric Vehicles (BEVs) creates a suite of intertwined R&D challenges. In addition to the R&D challenges for vehicles and battery technologies, there is a distinct need to understand how fast charging up to 400 kW will impact Electric Vehicle Service Equipment (EVSE) and XFC-related infrastructure costs. Design of these charging

stations needs to take into account a host of different issues including power electronics and elevated current and voltage levels for vehicle charging. Performance requirements and gaps for XFCs can be found at: https://www.energy.gov/sites/prod/files/2017/10/f38/XFC%20Technology%20Gap%20Assessment%20Report_FINAL_10202017.pdf [1].

Given the planned voltage and current levels for XFC, these systems necessitate high power semiconductors to achieve high power levels and short recharge times. A medium voltage grid input can reduce installation costs and increase efficiency for vehicle charging, using solid state approaches to grid isolation and power conditioning, which can contribute to grid reliability and resilience as well as national security. In particular, high voltage Silicon Carbide (SiC) devices are particularly suited to this application given their inherently high breakdown voltage and low loss characteristics. This topic seeks to develop devices with higher current and voltage ratings that will enable improvements in vehicle extreme fast chargers.

This topic seeks to address this barrier through demonstrating the successful production of > 150A, > 1200V rated SiC devices that are suitable for extended use in high power EVSE. Specifically, devices produced should show application readiness through passing full or partial qualification specifications or standards at high device production yields. Device production quantities are not expected to be sufficient to pass full qualification for Phase 1 projects. Where possible, applicants should show a relationship to, and demonstrate an understanding of, electric vehicle charging application requirements and environments. Examples include surface and/or substrate treatments and processing; compatibility with existing power module or power stage packaging and processing; and design for long-term reliability such as device degradation. Projects should show a path towards full qualification with commercial-ready devices integrated into a functional module by the end of Phase II.

Questions – contact: Steven Boyd, steven.boyd@ee.doe.gov

c. Reduction of Thermal and Friction Losses in Internal Combustion Engines

Applications are sought to develop technologies that can provide significant fuel efficiency gains to reciprocating internal combustion engines without appreciable increases in cost or complexity. Potentially effective approaches for increasing efficiency include improved thermal management strategies, such as thermal barrier coatings or efficient, low-cost waste heat recovery strategies, and friction reduction strategies, such as low friction coatings or surfaces. Refer to the Advanced Combustion and Emission Control Roadmap here: https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf [1].

Applications must demonstrate that the target technologies:

- Are viable in current reciprocating engine architectures;
- Are compatible with widely available fuels and lubricants;
- Have a low expected additional cost to implement on an automotive or heavy-duty engine;
- Work reliably for the typical lifetime of the vehicle;
- Are likely to be successfully implemented on a modern, production automotive engine in Phase II.

Reporting must include fuel consumption test results compared with a second, unmodified, otherwise identical engine. All fuel consumption testing must be conducted according to engine industry norms. Statistically valid fuel economy improvements (95% confidence level) of at least 2.0% are desired.

Questions – contact: Mike Weismiller, Michael.Weismiller@ee.doe.gov

d. Co-Optimization of Fuels and Engines

On-road transportation is likely to remain reliant on liquid fuels for decades, due to the superior energy density and fast refueling times that liquids afford. As a result, although electrification has promise to displace internal combustion engines in some applications, advances in combustion will still have substantial impact on transportation-based energy consumption and emissions [1]. While benefits can be obtained by improving fuel resources or engine designs independently, even larger impact can be had by optimizing new fuels/engines in conjunction with each other. For example, rather than finding new fuels that can be integrated into existing engines—such as higher ethanol blends in stock gasoline engines, and biodiesel into typical Diesel engines—or making incremental refinement of existing engines using traditional fuels, there is even greater opportunity in developing new engines to harness the unique properties of alternative fuels. As a result, grant applications are sought to develop engines that are co-optimized for operation on a non-traditional liquid fuel, including:

- Light-duty engine designs that utilize a multi-mode combination of spark-ignition and compression-ignition of biomass-based liquid fuel blends to optimize engine operation across the entire load map. These engines should be able to demonstrate at least a 10% improvement in fuel economy over baseline spark-ignition-gasoline operation (i.e., comparable engine on AKI 87 gasoline).
- Medium- and heavy-duty engine designs that use non-diesel/biodiesel liquid fuels in compression-ignition architectures. At minimum, such approaches should be able to achieve traditional Diesel torque and efficiency, but with a significant reduction in criteria pollutants and carbon impact.
- Non-traditional engine designs (such as opposed piston engines, or similar architecture deviations) that operate on a suitably co-optimized liquid alternative fuel. The benefits for such technologies must be proportional to the level of deviation required from traditional engine production processes.

Applications that heavily rely on fuels/additives that are not currently produced at significant scale should include techno-economic analysis to justify commercial potential.

Questions – contact: Kevin Stork, kevin.stork@ee.doe.gov

e. Improving the Performance and Reducing the Weight of Cast Components for Vehicle Applications

Vehicle Technologies Office Materials Technology Program targets 25% glider weight reduction at less than $5/lb-saved by 2030. Materials play a major role in the U.S. DRIVE Partnership by enabling lightweighting of structures and systems to improve fuel economy and by reducing demands on the vehicle powertrain and ancillary systems [1]. To accomplish these goals it is necessary to reduce the weight of all components within the vehicle. Cast metal components, made from cast iron, aluminum alloys, and magnesium alloys represent a significant percentage of the total vehicle weight and will need to be addressed to meet the stated goals. Although weight reductions can be achieved through materials substitution, the performance of cast metal components is often dominated by the imperfections in the casting that result from the casting process.

Applications are sought to develop and improve casting processes that result in a significant reduction in casting imperfection leading to increases in component strength, fatigue life, and allowing redesigns that lead to significant (>20%) reductions in component weight.

Applications should provide baseline data on target casting process, component, component performance, and baseline material composition(s) and properties. Proposals should include a clear description of the imperfections to be addressed and the methodology to be employed to make the proposed improvements.

Applications should show a pathway to commercial high volume production rates necessary for the automotive industry and demonstrate that there is a high likelihood that the cost effectiveness targets of $5/lb-saved can be achieved by 2030.

This topic does not include a new materials development program and applications containing a new materials development program will be considered out of scope.

Questions – contact Jerry Gibbs, jerry.gibbs@ee.doe.gov or Sarah Kleinbaum, sarah.kleinbaum@ee.doe.gov

f. Low Cost, Lightweight, and High-Performance Fiber-Reinforced Composites for Vehicle Applications

The Vehicle Technologies Office's Materials Technology Program targets 25% glider weight reduction at less than $5/lb-saved by 2030. Materials play a major role in the U.S. DRIVE Partnership by enabling vehicle lightweighting of structures and systems to improve fuel economy and reduce demands on the vehicle powertrain and ancillary systems. The Materials Technical Team in the U.S. DRIVE updated its roadmap in October 2017[1]. Within this roadmap, the area of carbon fiber composites, is one of the four material systems the automotive industry is most interested in. Current materials focus is solely for primary structure applications; however, there are many secondary structures of vehicle components, which are also critical and important with high demand to the automotive industry.

Applications are sought to develop and test new innovative ideas including carbon fiber and beyond the carbon fiber and their composites. In addition to low cost carbon fiber research, applications can include development of alternative fibers (e.g., natural fiber/bio-degradable fiber) and resins (e.g., polymers, bio-degradable polymer, fast curing resin), and their processes or any forms of the fiber-reinforced materials such as(continuous, discontinuous, particulate fibers, or hybrid that can benefit vehicle's lightweight and high performance with affordable cost. Applications can also include development of innovative and cost-effective manufacturing processes, such as low-cost, high-speed manufacturing with net shape, reducing manufacturing cycle time to less than 3 minutes (ideally for 90 seconds), and development of composite intermediates (e.g., prepregs, injection molding compound, SMC, BMC, long-fiber thermoplastics, non-crimp fabrics, and nonwovens) in which the expected outcomes can significantly help and support automotive industry utilizing fiber-reinforced composites in high-volume production.

The process from manufacturing carbon fiber to production of finished components is wasteful; it is estimated that more than 30% of produced carbon fiber ends up as waste at some point in the process. One area the carbon fiber composites industry differs from other industries is the high proportions of waste during fiber production and the lack of an effective recycling solution and recyclability. Applications are also sought to develop viable recyclability technologies that can help save carbon fiber or non-carbon fiber composites waste and for future lightweight vehicle reusability.

Questions – contact Felix Wu, felix.wu@ee.doe.gov or Will James, charles.james@ee.doe.gov

References:
[1] Vehicle Technologies Office (FCTO) https://www.energy.gov/eere/vehicles/vehicle-technologies-office

Subtopic a) References:
[1] Critical Materials Strategy:
https://www.energy.gov/policy/initiatives/department-energy-s-critical-materials-strategy
[2] USABC Energy Storage System Goals http://www.uscar.org/guest/article_view.php?articles_id=85
[3] USABC Manuals: www.uscar.org/guest/article_view.php?articles_id=86

Subtopic b) References:
[1] Enabling Fast Charging: A Technology Gap Assessment:
https://www.energy.gov/sites/prod/files/2017/10/f38/XFC%20Technology%20Gap%20Assessment%20Report_FINAL_10202017.pdf

Subtopic c) References:
[1] Advanced Combustion and Emission Control Roadmap:
https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf

Subtopic d) References:
[1] Advanced Combustion and Emission Control Roadmap:
https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf

Subtopic e) References:
[1] Materials Technical Team Roadmap:
https://www.energy.gov/eere/vehicles/downloads/us-drive-materials-technical-team-roadmap

Subtopic f) References:
[1] Materials Technical Team Roadmap:
https://www.energy.gov/eere/vehicles/downloads/us-drive-materials-technical-team-roadmap

8. WATER

Maximum Phase I Award Amount: (b) (5)	*Maximum Phase II Award Amount:* (b) (5)
Accepting SBIR Applications: **YES**	*Accepting STTR Applications:* **YES**

The Office of Energy Efficiency and Renewable Energy's Water Power Technologies Office (WPTO) (http://energy.gov/eere/water/water-power-program) conducts early-stage research and development to strengthen the body of scientific and engineering knowledge enabling industry to develop new technologies that increase U.S. hydropower and marine and hydrokinetic (MHK) generation. Hydropower and MHK energy generate renewable electricity that supports domestic economic prosperity and energy security while enhancing the reliability and resiliency of the U.S. power grid.

MHK technologies convert the energy of waves, tides, and river and ocean currents into electricity and have the potential to provide locally sourced, clean, and reliable energy. MHK is a predictable, forecastable resource with a generation profile complimentary to the seasonal or temporal variations of other resources such as onshore wind and solar, which can enhance its contributions to grid resilience and reliability. MHK

technologies also have the potential to provide cost-effective energy for numerous existing maritime markets, including non-grid connected or remote coastal areas, ocean-based sensors, monitoring equipment (for civilian, scientific, industrial, and national security functions), and autonomous vehicle recharging at sea, as well as reducing desalination costs by avoiding the step of generating electricity.

Applications may be submitted to any of the subtopics below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis and;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

During Phase II, DOE may consider providing additional resources for up to 150 labor-hours at one or more national laboratories time in addition to the SBIR/STTR funding to the applicants if needed. Such national laboratory resources may be useful to assess testing and performance. If the applicant(s) desire such national laboratory resources they must include a description of the resources required.

Grant applications are sought in the following subtopics:

a. Microgrid for Improved Resilience in Remote Communities through Utilization of Marine Hydrokinetics and Pumped Storage Hydropower

Applications are sought for developing microgrids for remote rural communities that enhance the ability of marine hydrokinetics (MHK) technologies to contribute to grid reliability and resilience. MHK offer the capability to reliably provide base load power in these communities in a resilient manner that is less exposed to extreme weather events than other renewable resources.

In 2017, the National Academy of Sciences found that 'There is enormous technical potential to using microgrids to make electric service more resilient. This field of research and application is evolving quickly with new control systems, sensors, and distributed energy sources. This rapid evolution of the frontier of technical capabilities is opening a potentially wide gulf between the technical capabilities of microgrid systems and the real world systems that are operational.' To help bridge this gulf, the WPTO is interested in real world applications of marine renewable energy (MRE) technologies that can operate as a base load power supply in small microgrid systems (100KW-1MW) to provide power to remote communities.

- There is a need for development of more resilient power supply systems in remote rural communities that are vulnerable to power outages resulting from extreme weather events.
- Microgrids from renewable power sources also have the potential to reduce energy costs in communities that are dependent on diesel fuel for power.
- Marine current energy devices, in particular, are less exposed to extreme weather events and thus more resilient than other renewable sources.

Phase I awards under this topic will evaluate the Feasibility of a proposed microgrid based on the following:

- Identification of a specific rural community, with average annual electrical demand 100KW-1MW, that currently relies on diesel generators (DG) as primary power supply, and has nearby current energy (river or tidal) resources available to support microgrid operations.
- Possible inclusion of pumped-storage hydropower (PSH), utilizing either natural or man-made water reservoirs, for energy storage requirements to meet electrical grid requirements.
- The system is intended to replace the DGs, though DGs can be included for back-up power, i.e. the system should be capable of operating with the MHK devices supplying baseload operations without utilization of diesel generators.
- The study should include preliminary designs, including specific inverters, controllers and other major component requirements, and the associated system life cycle cost estimates.
- The study should compare life cycle costs for proposed system, based on available resources for particular community of interest, to the cost associated with the community's current diesel generator operations, maintenance and fuel.

Phase I should include component level testing required to complete the system design. It should also include testing plans to occur in the specific laboratory environment proposed for phase two.
The study should identify and model a system consisting of optimal mix of renewable and other local energy resources as appropriate, as well as storage requirements, to serve the community's energy needs.
Phase II awards under this topic will complete design and test the system in a laboratory environment utilizing Hardware in the Loop (HIL) to the greatest extent practical at facility such as NREL's National Wind Technology Center (NWTC) or the University of Alaska, Fairbanks' Power Systems Integration Lab at the Alaska Center for Energy and Power (ACEP).

Phase II must also include an evaluation of global potential for microgrids for improved resilience in remote communities with average annual electrical demand 100KW-1MW through utilization of MHK and PSH.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

b. Ocean Energy Storage Systems

Energy storage is a critical component of renewable energy systems to overcome intermittency. Research on electrochemical storage methods, and integration with renewable energy generation sources, has thus far focused on land-based systems such as solar and onshore wind. Generally these systems are poorly suited for the marine environment and are not optimized for integration with marine energy systems such as wave energy converters or tidal energy turbines. The WPTO has identified numerous non-grid applications that could benefit from marine energy, but nearly all of them require an energy storage component. Examples include charging underwater vehicles at sea, powering ocean research devices, and providing emergency sources of electricity. For a marine energy converter to successfully enter these markets it must have a well-defined and reliable energy storage system.

WPTO seeks to fund research and development of novel ocean energy storage systems that can provide functions similar to electrochemical battery storage and are designed for integration with marine energy systems. Examples of research could include systems using pneumatic, hydraulic, or thermal energy storage. Ocean energy storage could also include systems that are analogous to compressed air energy storage (CAES) or pumped-hydro storage (PHS), but operate underwater using the weight of the water column to pressurize a fluid or gas. Novel electrochemical storage systems that require ocean water for operation may be considered

if marine energy conversion is clearly described as an integral component of the design. The WPTO will consider technologies for various scales and capacities, though the end use application must be clearly identified.

Phase I awards under this topic will carry out early-stage, proof-of-concept research into novel marine energy storage concepts in a laboratory setting. Phase I research should define and design a storage system and perform sufficient laboratory testing to inform the relative merits of the technology and its potential for scaling-up or commercialization. Laboratory work may include initial research to guide design, testing of initial components and designs, or other necessary steps in early-stage development. In Phase II, the awardee(s) will continue to develop the proposed ocean energy storage system identified in Phase I by building a functioning prototype system and testing in an intended environment or in a laboratory setting using hardware-in-the-loop testing regime. Phase II awardee(s) must present a clear path for the commercialization of the proposed technology.

Applicants must demonstrate knowledge, experience, and capabilities in developing ocean energy storage systems and include the following in their application:

- A clear description of the specific end-use application for the storage system; for example, charging underwater vehicles or aerial drones; balancing the grid, or offshore aquaculture farms.
- Required system components, including but not limited to: interconnection, mating, or delivery hardware that allows the storage system to deliver energy to the specified application (e.g. docking station for underwater vehicles or drones); power management system and controllers; other auxiliary systems.
- If applicable, how the system can be charged by marine energy systems such as wave, tidal, or ocean current energy converters.
- The state-of-the-art for incumbent technologies and how the proposed design will overcome existing limitations or pain points faced by end-users.
- Capacity rating, rates of charge and discharge, and cycling characteristics of the proposed system should be included
- Details of work to be performed in Phase I including the design plan, the resources required, and the intended performance targets
- Description of Phase II work including the scale of the demonstration prototype, the desired test location or facility, and if possible, end-user partners.

Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, the commercialization plan for the energy storage system to be developed under this topic.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

c. Pumping and Compression using Marine and Hydrokinetic Energy

Water pumping is required for many different types of operations, including: cooling for manufacturing, datacenters, air conditioning, or power generation plants; seawater desalination, irrigation of crops; onshore and offshore aquaculture, or pumped-storage hydro, among many others. Compression is needed for refrigeration or other systems that use gases or compressible liquids as their working fluid.

Where these applications exist in off-grid areas, the power for pumping or compression is typically provided by diesel generators, contributing to unnecessary costs and emissions. MHK may be able to supplant these fossil fuel powered pumps and compressors using the energy contained in oceans and rivers.

MHK pumping has often been considered for desalination systems, in particular wave powered reverse osmosis systems. However, challenges remain in determining how best to integrate these technologies. Wave energy converters often act as intermittent positive displacement pumps, delivering seawater at variable flow and non-constant pressures, occasionally resulting in water hammer effects. These pressure fluctuations can be damaging for downstream system components, such as membranes, filters, heat exchangers, or valves. Research addressing these issues is elemental to many different off-grid applications for MHK technologies that require pumping or compression, as well as riverine applications such as freshwater aquaculture or crop irrigation.

WPTO seeks to fund research and development of novel MHK-powered pumping or compression systems to directly pump water or compress gases for off-grid applications. Steady flow, high-head (for pumping systems), high-efficiency designs with minimal maintenance are of particular interest. Research should identify specific end-users or applications for the system and clearly demonstrate how the proposed technology meets customer needs.

Phase I awards under this topic will carry out early-stage, proof-of-concept research into novel MHK pumping or compression systems. Phase I research should define and design a pumping or compression system and should perform sufficient laboratory testing to inform the relative merits of the technology compared to incumbent technologies and its potential for scaling-up or commercialization. Consideration must be given to the delivery system which will deliver the working fluid to the end-user or application. In Phase II the awardee(s) will continue to develop the proposed MHK pumping or compression system by building a functioning prototype and testing in an intended environment or in a laboratory setting using a hardware-in-the-loop testing regime.

Applicants must demonstrate knowledge, experience, and capabilities in developing MHK pumping systems and include the following in their application:

- A clear description of the specific end-use application for the pumping or compression system and how it will meet end-user requirements, e.g. wheat crop irrigation in remote communities to supply 10 m3/hr with a total dynamic head of 150 meters for a pumping system
- The MHK resource that will be used to power the system.
- The state-of-the-art for incumbent technologies and how the proposed design will overcome existing limitations, costs, or other pain points faced by end-users.
- The predicted volumetric flow rate, total dynamic head, and other relevant calculated performance characteristics of the intended system as applicable.
- The predicted electrical power or fuel displaced by the proposed design.
- Details of work to be performed in Phase I including the design plan, the resources required, and the intended performance targets.
- Description of Phase II work including the scale of the demonstration prototype, the desired test location or facility, and if possible, end-user partners.

Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, the commercialization plan for the MHK pumping or compression system to be developed under this topic.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

d. High Value Critical Mineral Extraction from the Ocean Using Marine Energy

The demand for critical minerals is growing, based on likely future scarcities and security concerns for obtaining minerals from international sources that may not be readily accessible to the United States. Most rare earth elements (REEs) and valuable minerals used in the United States are imported from other nations. This reliance on foreign supply constitutes an industrial and national security concern. The development of lower-cost domestic extraction of minerals from the ocean will make these sources more economically attractive; help alleviate international supply concerns; and relieve permitting, waste disposal, and public opinion concerns for terrestrial mining operations. Of particular importance are those elements for which the United States does not have significant domestic resources or for which there is significant risk of supply disruption. Elements that are considered critical include the REEs (e.g., neodymium, dysprosium, europium, yttrium, and terbium), lithium, tellurium, gallium, and indium.

Seawater contains large amounts of minerals, dissolved gases, and specific organic molecules that can play a role as energy sources or in other industrial uses. Some of the most valuable minerals include the 17 REEs, precious metals, lithium, and uranium. Seawater minerals are generally distributed evenly in seawater. These minerals can be recovered from seawater using adsorption methods that do not require filtering vast amounts of seawater.

Marine Energy could open up unexploited opportunities in seawater mining, which could further expand mineral and gas markets. Seawater mining would also improve the diversity of the U.S. mineral supply chain, eliminating reliance on any one supplier, and provide a price ceiling on the cost of terrestrially obtained critical materials. Extraction of minerals from seawater requires power to operate mechanical adsorbent exposure mechanisms, pump seawater, and operate the electrochemical cell in electrochemical extraction systems.

WPTO seeks applications for developing alternatives to foreign-sourced critical materials using marine energy to address US security, trade gaps, and mineral scarcity. Critical materials include, but are not limited to, rare earth elements.

In Phase I awardees will carry out (1) a proof of concept which includes appropriate lab testing for extracting minerals from sea water using marine energy; (2) a study to understand economics and scales to extract high value minerals commercially and (3) design a prototype for testing in Phase II. In Phase II the awardee(s) will build and test a promising mineral extraction technology powered by a small scale marine energy device.

Applicants must also demonstrate knowledge, experience, and capabilities in marine energy capture as well as an understanding of sea water mineral extraction technologies and include the following in their application:

- Description of the required marine energy generation infrastructure and power requirements
- Description of mineral extraction technologies and efficiencies being considered
- Concepts on platforms for concentrated mineral solute transfer or similar materials transfer

- Identification of US mineral trade gaps / mineral security that could be commercially addressed by this technology
- US Exclusive Economic Zone (EEZ) siting options with marine energy resource assessment alignment for: wave, tidal, current, and or OTEC
- Details of work to be performed in Phase I
- Description of Phase II work including use of national lab resources if desired by the applicant

Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, the commercialization plan for high value mineral extraction from the ocean using marine energy to be developed under this topic.

Questions – Contact: Rajesh Dham, rajesh.dham@ee.doe.gov

Subtopic a) References:

[1] National Academies of Sciences, Engineering, and Medicine. 2017. Enhancing the Resilience of the Nation's Electricity System. Washington, DC: The National Academies Press.
[2] Burr, Michael, Camilleri, John, Lubkeman, David, Long, Qian, and Du, Yuhua. Microgrid optimized resource dispatch for public-purpose resiliency and sustainability. United States: N. p., 2017. Web.
[3] Baring-Gould, Edward I., Haase, Scott G., Jimenez, Antonio, and Olis, Daniel R. Kokhanok Renewable Energy Retrofit Analysis. United States: N. p., 2017. Web. doi:10.2172/1418968.
[4] Giraldez Miner, Julieta I, Singh, Shruti, and Gao, David Wenzhong. Cost Analysis of Renewable Energy-Based Microgrids. United States: N. p., 2017. Web. doi:10.1109/NAPS.2017.8107241.
[5] -Hernando, Daniel, Farahmand, Hossein, Holttinen, Hannele, Kiviluoma, Juha, Rinne, Erkka, Söder, Lennart, Milligan, Michael, Ibanez, Eduardo, Martínez, Sergio Martín, Gomez-Lazaro, Emilio, Estanqueiro, Ana, Rodrigues, Luis, Carr, Luis, van Roon, Serafin, Orths, Antje Gesa, Eriksen, Peter Børre, Forcione, Alain, and Menemenlis, Nickie. Hydro power flexibility for power systems with variable renewable energy sources: an IEA Task 25 collaboration: Hydro power flexibility for power systems. United States: N. p., 2016. Web. doi:10.1002/wene.220.

Subtopic b) References:

[1] EnergieSpeicher. 2017. "Storing energy at sea." http://forschung-energiespeicher.info/en/projektschau/gesamtliste/projekt-einzelansicht/95/Kugelpumpspeicher_unter_Wasser/
[2] Shepard News. 2015. "US works on underwater UUV recharging." August 25. 4137 https://www.shephardmedia.com/news/uv-online/us-works-underwater-uuv-recharging/.
[3] The Economist. 2016. "Depths of imagination: Pumped storage gets a makeover." https://www.economist.com/science-and-technology/2016/11/05/depths-of-imagination
[4] Townsend, Nicholas, and Ajit Shenoi. 2013. "Recharging autonomous underwater vehicles from ambient wave 4175 induced motions." Oceans. San Diego, CA. September 23–27, 2013.

Subtopic c) References:

[1] Energy Smarts. 2013. "Massachusetts Oysters Go Solar." March 27. http://blog.mass.gov/energy/green-3748 business/massachusetts-oysters-go-solar/.
[2] Google Data Centers. n.d. "Efficiency: How we do it." Accessed April 7, 2018. 3808 https://www.google.com/about/datacenters/efficiency/internal/.

[3] Gunawan, Budi, Vincent S. Neary, Josh Mortensen, and Jesse D. Roberts. 2017. Assessing and Testing 3824 Hydrokinetic Turbine Performance and Effects on Open Channel Hydrodynamics: An Irrigation Canal Case 3825 Study. U.S. Department of Energy, DOE/EE-1537. 3826. https://www.energy.gov/sites/prod/files/2017/04/f34/Assessing-Testing-Hydrokinetic-Turbine-Performance-3827 Effects.pdf.
[4] Toner, Damien, and Mo Mathies. 2002. "The Potential for Renewable Energy Usage in Aquaculture." 4173 Aquaculture Initiative. 54 pp. http://www.aquacultureinitiative.eu/Renewable%20Energy%20Report.pdf.

Subtopic d) References:

[1] DE-FOA-0001885: RFI: Marine and Hydrokinetic Technologies: Maritime Markets Report - Potential Maritime Markets for Marine and Hydrokinetic Technologies: Draft Report April 2018 – Chapter 7 Seawater Mining: Minerals and Gasses
https://eere-exchange.energy.gov/#Foaldb8a4d4f5-1398-438d-afe1-876763816a8c

9. WIND

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount: (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Office of Energy Efficiency and Renewable Energy's Wind Energy Technologies Office (https://energy.gov/eere/wind/wind-energy-technologies-office), seeks applications for innovations that significantly reduce the cost of energy from U.S. wind power resources for land-based, offshore and distributed wind turbines. The Wind Energy Technologies Office (WETO) is seeking proposals for technology innovations with the potential to enable wind power to generate electricity offshore and in all 50 states cost competitively with other sources of generation.

Today, wind energy provides over 6% of the nation's total electricity generation. At the end of 2017, over 81,000 wind turbines, totaling 1,076 megawatts (MW) in cumulative capacity, were deployed in distributed applications across all 50 states, the District of Columbia, Puerto Rico, Guam, and the U.S. Virgin Islands. Additionally, 89 gigawatts (GW) of utility-scale wind turbines are installed across 41 states plus Puerto Rico and Guam. Finally, one of the smallest states in terms of both geographic size and installed wind capacity marked a major milestone in 2016, as the nation's first offshore wind project, the 30 MW Block Island project in Rhode Island, achieved commercial operation. With wind power generation exceeding 10% in 14 states, wind is a demonstrated clean, affordable electricity resource for the nation.

WETO aims to advance scientific knowledge and technological innovation to enable clean, low-cost wind energy options nationwide. WETO Research, Development, Demonstration and Deployment (RDD&D) activities are applicable to utility-scale land and offshore wind markets, as well as distributed turbines—typically interconnected on the distribution grid at or near the point of end-use. Achieving LCOE goals will support deployment of wind at high penetration levels, sufficient to meet up to 20% of projected U.S. electricity demand in 2030, and up to 35% in 2050, compared to over 6% of demand in 2017. DOE plays a unique and valuable role in enabling the wind industry and its stakeholders to meet core challenges to industry growth through innovation to reduce wind technology costs and mitigate market barriers enables deployment and drives U.S. economic growth.

All applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. Vision or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis and; justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Coordinated and Secure Distributed Wind System Control and Communications Technologies

Cost reductions, more reliable technology, and consumer friendly business models are making distributed generation (DG) technologies (e.g. solar, storage, wind) more accessible to residential, commercial, and industrial power customers interested in self-generating their power. To remain competitive in this expanding global market, U.S. manufacturers of small and medium-size wind turbine technology must optimize their designs for distributed applications and reduce total installed costs. Over the past 10 years, the majority of public and private sector funding for wind turbine research and development (R&D) has gone towards creating increasingly larger wind turbine designs for utility-scale applications. Many of the learnings from these R&D investments can be leveraged to help U.S. manufacturers develop next-generation small and medium-scale wind turbine technologies for distributed applications, and support the development of standardized components, such as inverters, towers and foundations, for balance of plant and soft cost reductions.

To enable interoperability between distributed energy resources (DERs)and the flexible electricity loads they support, research and development is needed to enhance the ability of DERs to contribute to grid reliability and resilience as well as national security—specifically, through coordinated and secure controls and communications technologies. The goal of this topic is to add low-cost, validated and secure control and communication capabilities for wind technology, at all scales used in distributed applications, to integrate in a seamless "plug-and-play" manner with other DERs. Proposals should primarily address technical challenges related to wind technology while addressing the common communication and security requirements for all distributed energy resources. In addition, proposals should complement solar and/or storage technologies to advance the interests of multiple EERE programs. [1,2]

Questions – contact Michael Derby, michael.derby@ee.doe.gov

b. Remote Diagnostic Technologies to Reduce Offshore Wind Operating, Maintenance, and Repair Costs, and Increase System Reliability

Currently, 41 U.S. states have deployed utility-scale wind. WETO's programmatic goals are to reduce the unsubsidized market LCOE for utility-scale land-based wind energy systems from a reference wind cost of 5.6 ¢/kWh in 2015 to 5.2 ¢/kWh by 2020 and 3.1 ¢/kWh by 2030. WETO-funded research, development and demonstration of innovative utility-scale turbine technologies has enabled cost-competitive utility-scale wind. With additional untapped utility-scale land-based and offshore wind markets in all 50 states, the office invests in early-stage applied energy science research, development, and validation activities for utility-scale wind.

Remote monitoring, inspection, and repair of offshore wind turbine and foundation components can reduce operations and maintenance (O&M) costs and avoid energy production losses caused by unscheduled downtime and weather delays. WETO is seeking proposals for development or adaptation of innovative technologies employing advanced materials and manufacturing processes to increase U.S. offshore wind plant operators' abilities to carry out system health diagnostics remotely, plan service events in advance of possible failures, and limit the need for on-site technician time. Innovative technologies may include hardware, sensors, instruments, and/or software tools that facilitate key steps in the maintenance and repair process, such as: detection, identification, quantification, decision making, and planning. Software may utilize advances in artificial intelligence and should ensure cyber security of any internet functionalities. Technologies may be applicable to specific elements of the offshore system including blades, foundations, turbine mechanical, turbine electrical, and control electronics, but must be able to function reliably in harsh marine environments for the intended use, whether above or below the waterline. Ideally, operation of and communication with the innovative technology could be carried out in conjunction with the standard cabling and supervisory control and data acquisition (SCADA) system of the turbine and the wind plant. [3,4]

Questions – contact Michael Derby, michael.derby@ee.doe.gov

c. Other in Wind Turbine Blade Recycling

In addition to the specific subtopics listed above, WETO invites grant applications in other areas relevant to wind turbine blade recycling that enable wind power nationwide [5,6].

Questions – contact Michael Derby, michael.derby@ee.doe.gov

Subtopic a) References:

[1] Distributed Wind Energy Association (DWEA), 2015, DWEA Distributed Wind Vision – 2015-2030 Strategies to Reach 30 GW of "Behind-the-Meter" Wind Generation by 2030, p. 26. (http://distributedwind.org/wp-content/uploads/2012/08/DWEA-Distributed-Wind-Vision.pdf)
[2] Jenkins, J., Rhoads-Weaver, H., et al., 2013, SMART Wind Roadmap: A Consensus-Based, Shared-Vision Sustainable Manufacturing, Advanced Research & Technology Action Plan for Distributed Wind, Distributed Wind Energy Association, Durango, Colorado, p. 110. (http://distributedwind.org/wp-content/uploads/2016/05/SMART-Wind-Roadmap.pdf)

Subtopic b) References:

[3] U.S. Department of Energy, 2015, Wind Vision: A New Era for Wind Power in the United States, p. 350. doi:10.2172/1220428 (http://energy.gov/sites/prod/files/2015/03/f20/wv_full_report.pdf)
[4] U.S. Department of Energy, U.S. Department of Interior, 2016, National Offshore Wind Strategy: Facilitating the Development of the Offshore Wind Industry in the United States, p. 84. (http://energy.gov/sites/prod/files/2016/09/f33/National-Offshore-Wind-Strategy-report-09082016.pdf)

Subtopic c) References:

[5] U.S. Department of Energy, 2015, Enabling Wind Power Nationwide, p. 56. doi:10.2172/1220457 (http://energy.gov/sites/prod/files/2015/05/f22/Enabling-Wind-Power-Nationwide_18MAY2015_FINAL.pdf)
[6] Larsen, H.H., & Sønderberg Petersen, L., 2014, DTU International Energy Report 2014: Wind Energy — Drivers and Barriers for Higher Shares of Wind in the Global Power Generation Mix, Technical University of Denmark, p. 91-97. (http://orbit.dtu.dk/files/102457047/DTU_INTL_ENERGY_REP_2014_WIND.pdf)

10. JOINT TOPIC: ADVANCED MANUFACTURING AND SOLAR ENERGY TECHNOLOGIES OFFICES

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount: (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Solar Energy Technologies Office (SETO) supports early-stage research and development to improve the affordability, reliability, and performance of solar technologies on the grid. A specific effort is devoted to cutting-edge research and development that will help the solar industry to reduce the cost of manufacturing solar technologies to reach the 2030 cost targets [2, 3].

In this Topic, AMO and SETO seek applications for the development of innovative and impactful technologies that will support a strong solar manufacturing sector and supply chain in America, while producing cost-competitive modules that keep pace with the rising domestic and global demand for affordable solar energy. Applications must be responsive to the following subtopic. Applications outside of this area will not be considered. Within this topic, DOE is not interested in technologies and innovations related to racking optimization or mounting technologies. Applications in this space will be deemed non responsive. However, any innovation in module form factors should have a line of sight to easy deployment using current or soon to come racking/mounting technologies.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Applicants are encouraged to leverage capabilities of consortia from both AMO and SETO. The Rapid Advancement in Process Intensification Deployments (RAPID) Institute is one of AMO's public-private R&D consortia where manufacturers, small businesses, universities, national laboratories, and state and local governments are brought together to pursue coordinated early-stage R&D in high-priority areas essential to energy in manufacturing, including module manufacturing [4]. SETO's Durable Module Materials (DuraMAT)

Consortium [5], brings together national laboratories, universities, and industry to discover and develop new materials, testing methodologies, and designs for durable PV systems.

Grant applications are sought in the following subtopic:

a. Innovation in solar module manufacturing processes and technologies

The global PV market has changed dramatically over the past years. Module prices have been decreasing rapidly and global deployment is experiencing strong growth. However, manufacturing is concentrated mainly in Asia [6]. Innovation-driven cost, performance and quality improvements, along with strong projected solar demand in the United States and across the Americas, could increase the attractiveness of U.S.-based solar manufacturing. Although improvements to standard PV modules have produced deep cost reductions over the past years, the returns on such improvements appear to be diminishing, and more dramatic innovations in module design and manufacturing may be needed to maintain the path of rapid progress while opening further opportunities for domestic manufacturing.

Within the solar manufacturing value chain, module manufacturing represents one of the areas where innovation can be still introduced. Capital expenditures (CapEx) for a new module assembly line is lower relative to other components such as wafers and solar cell, but the process still requires several steps, some of them quite slow (e.g. lamination).

AMO and SETO are looking for new module manufacturing technologies, equipment development, individual process step innovation that can accomplish one or more of the following objectives:

- Modifications and repurposing of existing or dormant manufacturing technologies in order to utilize an existing infrastructure and demonstrate synergies with existing or new module technologies;
- Reduction of the number of steps in a module assembly (from cells or completed thin film device stack to completed module);
- Development of new tools or technologies that will increase the throughput of existing or new processes;
- Development of new module assembly technologies, methods and improved form factors that optimize module cost per watt;
- Development of module manufacturing methods that enable incorporation of new and upcoming cell technologies such as perovskite or other high efficiency solar cells such as monolithic module manufacturing methods;
- Development of new module technologies and equipment that lower the tool footprint or optimizes usage of the factory floor;
- Replacement of manufacturing bottlenecks (e.g. lamination, encapsulation) with faster and more efficient processes;
- Development of techniques that could allow for the manufacture of mechanically staked or fully integrated tandem technologies.

In the Phase I of these projects, DOE expects applicants to analyze the feasibility of a new technology or process, identify and do preliminary work with relevant stakeholders to ensure easy access to facilities to test, validate, and prototype the new design. A prototype should be developed with the goal to embed or test it in a real-world assembly line or a dormant facility during Phase II.

Questions – contact solar.sbir@ee.doe.gov and Dickson.Ozokwelu@ee.doe.gov

References:

[1] https://energy.gov/eere/amo
[2] https://energy.gov/solar-office
[3] https://www.energy.gov/eere/solar/goals-solar-energy-technologies-office
[4] https://www.aiche.org/rapid
[5] https://www.duramat.org/capabilities.html
[6] https://www.nrel.gov/docs/fy16osti/65788.pdf

11. JOINT TOPIC: ADVANCED MANUFACTURING AND GEOTHERMAL TECHNOLOGIES OFFICES

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount: (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Geothermal Technologies Office (GTO) focuses on applied research, development, and innovation to advance hydrogen and fuel cells for transportation and diverse applications enabling energy security, resiliency, and a strong domestic economy in emerging technologies [2].

In this Topic, AMO and GTO partner to solicit innovative research and development projects capable of addressing both critical material and critical water issues. This topic supports the priorities of the Acting Assistant Secretary for EERE to address 1) critical water issues: improve long-term access to clean, affordable water supplies, including technical challenges at the nexus of energy and water (energy used to produce clean water and water used in energy production) and identify ways to produce and ensure the availability of water during long term outages; and 2) critical materials: developing technologies to reduce the impediments to domestic critical materials production, finding alternatives to foreign-sourced critical materials, and developing technologies to reuse and recycle critical materials.

The Phase I application should detail design and bench scale systems that are scalable to a subsequent Phase II prototype development. Applications must be responsive to the following subtopic. Applications outside of this area will not be considered.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to baselines from the EERE Study [3];
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;

- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Geothermal Desalination and Critical Material Recovery Systems

Desalination systems take an impaired water source and produce fresh water and a concentrated brine waste stream. A typical source is seawater with approximately 35,000 ppm total dissolved solids (TDS), but other sources can include coal tailing, industrial waters, and produced waters from oil and gas, which have higher TDS. The concentrated brine byproduct is a good target for mineral recovery operations because the critical material(s) of interest will occur in higher concentrations which may improve the economics for their recovery.

To be responsive to this topic, the small business must propose a research and development project that aims to commercialize a system that will accomplish both desalination and recovery of a critical material. For this subtopic, the process must use a geothermal heat source. Specifically, the system must yield fresh water with less than 500 ppm TDS while recovering at least one critical material, which can include, but is not limited to, rare earth elements. A comprehensive list of 35 mineral commodities deemed critical under the definition from Executive Order 13817 was recently published by the Secretary of the Interior [4].

Because the material recovery and water processing scale differently to address their commercial needs, it is recommended that each applicant select a primary goal for their system (i.e., design a critical material recovery system that is capable of treating water or vice versa). The current benchmark for thermal seawater desalination is multi-stage flash whose energy intensity is estimated at 15 kWh per meter cubed with approximately 11 kWh coming from thermal energy [3]; however, more efficient thermal desalination systems are currently under development and energy intensity can vary increase significantly for higher TDS source waters.

Under this subtopic, the system must be tailored to make use of geothermal heat, with low temperature geothermal resources (<150 °C) being of particular interest in this application. These resources can come from lower temperature geothermal reservoirs or from cascaded applications from higher temperature geothermal resources. The impaired water sources primarily of interest in this subtopic are geothermal brines and produced waters from oil and gas.

Questions – contact joshua.mengers@ee.doe.gov

b. Desalination and Critical Material Recovery Systems from Other Energy Sources

In addition to the specific subtopic listed above, the Department also solicits applications that fall within the specific scope of the topic description above. Specifically, this subtopic will allow systems that use energy sources other than geothermal and will focus on systems that propose improvements in energy efficiency by at least 30%. The baseline for current typical energy intensity for seawater desalination is reverse osmosis at 3.3 kWh per cubic meter yielding costs of nearly $2 per cubic meter [3].

Questions – contact Tara.Gonzalez@ee.doe.gov

References:
[1] Advanced Manufacturing Office Website: https://energy.gov/eere/amo
[2] Geothermal Technologies Office Website: https://energy.gov/eere/geothermal
[3] "Bandwidth Study on Energy Use and Potential Energy Savings Opportunities in U.S. Seawater Desalination Systems." EERE Report, October, 2017
https://www.energy.gov/sites/prod/files/2017/12/f46/Seawater_desalination_bandwidth_study_2017.pdf
[4] "Final List of Critical Minerals 2018." Federal Register, Vol. 83, No. 97, May 18, 2018
https://www.gpo.gov/fdsys/pkg/FR-2018-05-18/pdf/2018-10667.pdf

12. JOINT TOPIC: ADVANCED MANUFACTURING AND FUEL CELL TECHNOLOGIES OFFICES

Maximum Phase I Award Amount: (b) (5)	Maximum Phase II Award Amount: (b) (5)
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Fuel Cells Technologies Office (FCTO) focuses on applied research, development, and innovation to advance hydrogen and fuel cells for transportation and diverse applications enabling energy security, resiliency, and a strong domestic economy in emerging technologies [2].

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Applications must be responsive to the following subtopic. Applications outside of this area will not be considered.

Applications are sought in the following subtopic:

a. Advanced Materials for Detection and Removal of Impurities in Hydrogen

High-performance membrane technologies have been explored in recent years for their potential to detect and remove contaminants from streams of hydrogen gas, to serve applications requiring high purities (e.g. petroleum refineries, glassmaking plants or hydrogen fueling stations) [3]. Today, the primary approaches to

management of contamination are: 1) the use pressure swing adsorption techniques at centralized hydrogen production facilities, and 2) design of distribution infrastructure technologies to mitigate the introduction of contaminants. Nevertheless, excursions can take place; examples of sources of potential contamination include lubricating oil in compressors, off-gassing from polymers, or residual water from steam methane reformers or electrolysis [3]. Contaminants can permanently deactivate catalysts (e.g. within upgrading equipment at refineries, or in fuel cells onboard vehicles). Current inline detectors at hydrogen filling stations for fuel cell vehicles are incapable of removing contaminants, or shutting down a dispenser in time to prevent them from reaching the vehicle.

This subtopic seeks concepts that can both detect and remove high-priority contaminants from hydrogen fuel. Concepts proposed should be capable of continuous operation at 875 bar and -40°C, such that the unit developed can be installed immediately upstream of a hydrogen dispenser. Contaminants of particular interest, based on their likelihood of occurrence and the level of damage they can do to a fuel cell, are: water, carbon monoxide, total sulfur, ammonia, and total hydrocarbons [4]. Phase I of proposed projects should develop and evaluate potential materials that are capable of removing water, carbon monoxide, sulfur and hydrocarbons from hydrogen fuel at stations to SAE J2719 levels [5], and design a concept that can both detect and remove contaminants. The designed system should be easily removable and replaceable once the expected lifetime expires. Concepts proposed should target a capital cost of <$5,000 and an annual operating cost of <$1,000. Phase II may include the development and experimental evaluation of a prototype.

Questions – contact neha.rustagi@ee.doe.gov and tara.gonzalez@ee.doe.gov

References:

[1] https://energy.gov/eere/amo
[2] https://www.energy.gov/eere/fuelcells/fuel-cell-technologies-office
[3] https://www.energy.gov/sites/prod/files/2015/04/f21/fcto_2014_hcd_workshop_1_report.pdf
[4] https://www.nrel.gov/docs/fy15osti/64063.pdf
[5] https://www.sae.org/standards/content/j2719_201109/

Subtopics with Priorities

KEY: National Security (Security), Technology Transfer (Tech Transfer), Cybersecurity (Cyber), Energy Storage (Storage), Critical Materials (Materials), Grid Integration (Grid), Manufacturing (Mfg), Critical Water (Water), Office of Electricity (OE), Office of Cybersecurity, Energy Security, and Emergency Response (CESER), Geographic Diversity (Geo)

1. ADVANCED MANUFACTURING
   a. Manufacturing Cybersecurity (Security, Cyber, Grid, Mfg, CESER)
   b. Atomic Precision for Gaseous Separations (Materials, Mfg, Water)
   c. Covetic Processing of Critical Materials and Strategic Materials (Storage, Grid, Materials, Mfg)
   d. Technology Transfer Opportunity: Electrochemical Recycling Electronic Constituents of Value (E-RECOV) (Security, Tech Transfer, Materials, Mfg)

2. BIOENERGY
   a. Cell-Free Biochemical Platforms to Optimize Biomass Carbon Conversion Efficiency (Mfg, Water, Geo)
   b. Reshaping Plastic Design and Degradation (Mfg, Water, Geo)
   c. Algae Engineering Incubator (Mfg, Water, Geo)

3. BUILDINGS
   a. Next Generation Residential Air Handlers (Grid)
   b. Novel Materials and Processes for Solid-State Lighting (Storage, Grid, Materials, Mfg)
   c. *Automated Point Mapping for Commercial Buildings (Grid)*
   d. *Complementing Building Energy Modeling (BEM) with Non-Energy Analyses (Grid)*

4. FUEL CELLS
   a. Fuel Cell Membranes and Ionomers (Security, Materials, Mfg)
   b. *Nozzles for High-Pressure, Low-temperature Gas Fills (Security, Storage, Mfg)*
   c. *Active Low Cost Thin Film Hydrogen Sensors (Security, Storage)*
   d. *Smart Sensors for Structural Health Monitoring (SHM) of Composite Overwrapped Pressure Vessels (COPVs) of On-board Hydrogen Storage for Fuel Cell Electric Vehicles (FCEVs) (Security, Storage)*
   e. Innovative Concepts for Hydrogen Conversion to Liquid Hydrocarbon Fuels (Security, Water)

5. GEOTHERMAL
   a. Improved downhole telemetry for geothermal drilling (Security, Grid)

6. SOLAR
   a. TECHNOLOGY TRANSFER OPPORTUNITY: Real-Time Series Resistance Monitoring in Photovoltaic Systems (Tech Transfer)
   b. TECHNOLOGY TRANSFER OPPORTUNITY: PV module Soiling Spectral Deposition Detector (Tech Transfer)
   c. Storage technologies to enable low-cost dispatchable solar photovoltaic generation (Storage, Grid, OE)
   d. Hardened solar system design and operation for recovery from extreme events (Security, Grid, Water)
   e. Rural solar (Water, Geo)
   f. Affordability, reliability, and performance of solar technologies on the grid (Security, Grid, Mfg, Materials)

7. VEHICLES

a. Electric Drive Vehicle Batteries (Storage, Grid, Materials)

b. SiC devices suitable for Electric Vehicle Extreme Fast Chargers (Security, Storage, Grid)

c. Reduction of Thermal and Friction Losses in Internal Combustion Engines

d. Co-Optimization of Fuels and Engines

e. Improving the Performance and Reducing the Weight of Cast Components for Vehicle Applications

f. Low Cost, Lightweight, and High-Performance Fiber-Reinforced Composites for Vehicle Applications (Materials)

8. WATER

a. *Microgrid for Improved Resilience in Remote Communities through Utilization of Marine Hydrokinetics and Pumped Storage Hydropower* (Security, Storage, Grid, Water, Geo)

b. Ocean Energy Storage Systems (Security, Storage, Water)

c. Pumping and Compression using Marine and Hydrokinetic Energy (Mfg, Water)

d. High Value Critical Mineral Extraction from the Ocean Using Marine Energy (Security, Water, Materials)

9. WIND

a. Coordinated and Secure Distributed Wind System Control and Communications Technologies (Security, Cyber, Grid)

b. Remote Diagnostic Technologies to Reduce Offshore Wind Operating, Maintenance, and Repair Costs, and Increase System Reliability (Cyber, Grid)

c. Other in Wind Turbine Blade Recycling

10. JOINT TOPIC: ADVANCED MANUFACTURING AND SOLAR ENERGY TECHNOLOGIES OFFICES

a. Innovation in solar module manufacturing processes and technologies (Security, Mfg)

11. JOINT TOPIC: ADVANCED MANUFACTURING AND GEOTHERMAL TECHNOLOGIES OFFICES

a. Geothermal Desalination and Critical Material Recovery Systems (Security, Materials, Mfg, Water)

b. Desalination and Critical Material Recovery Systems from Other Energy Sources (Security, Materials, Mfg, Water)

12. JOINT TOPIC: ADVANCED MANUFACTURING AND FUEL CELL TECHNOLOGIES OFFICES

a. Advanced Materials for Detection and Removal of Impurities in Hydrogen (Storage, Materials, Mfg)

Rodriguez, Susan (CONTR)

From:	Kaarsberg, Tina
Sent:	Friday, September 28, 2018 12:42 PM
To:	Tripodi, Cathy
Cc:	Fitzsimmons, Alexander;Jayne, Kevin A.;Booher, Patrick;Barth, John
Subject:	URGENT EERE SBIR FY 2019 Phase I Release 2 Topics Review Package
Attachments:	EERE FY19 Phase I Release 2 Topics 9 28 18 DAS approved.docx; EERE FY19 Phase I Release 2 Topics 9 28 18 track changes.docx
Importance:	High

Cathy,
Thank you for your attention to this review.
This is a reminder that the Departmental Deadline for the SBIR/STTR Topics from the Program Offices is Tuesday October 9. This DOE-SBIR deadline to all the program offices (e.g. EE, NE, FE, OE, NA) is based on meeting statutory deadlines.

Very few changes were made during the DAS review of the topics. I attach a track changes version of the so you can see the changes.
Please let me know if you would like to be briefed before you finalize your comments.
Thank You,

Tina Marie Kaarsberg PhD
SBIR/STTR Manager
Budget Office / EE-63B
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
T: 202 586-5112
M: (b) (6)
C: (b) (6)
6B-038, Room B6070
1000 Independence Ave. SW
Washington, DC 20585

-----Original Message-----
From: Barth, John
Sent: Monday, September 10, 2018 5:32 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Chalk, Steven <Steven.Chalk@ee.doe.gov>; Hogan, Kathleen <Kathleen.Hogan@ee.doe.gov>; Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jayne, Kevin A. <Kevin.Jayne@ee.doe.gov>; Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>; Garman, Sarah <Sarah.Garman@EE.DOE.Gov>; Roy, Molly <Molly.Roy@ee.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>; Booher, Patrick <Patrick.Booher@ee.doe.gov>; Kaarsberg, Tina <Tina.Kaarsberg@ee.doe.gov>
Subject: EERE SBIR FY 2019 Phase I Release 2 Topics Review Package

Cathy and DASs,

Attached is an action memo with three attachments presenting the proposed FY19 SBIR topics, and requesting your review/approval/modifications.

As you can see from the memo and the attached schedule, the DAS response is requested by 19 September. Once we consolidate the DAS responses, we will provide Cathy with an updated version for her review, which we request by 3 October.

Please let Dr. Kaarsberg or myself know if you have any questions or concerns.

Thank you,
John

FY 2019 EERE Small Business Innovation Research (SBIR) & Small Business Technology Transfer (STTR) Topics

Style Definition: List Paragraph,Paragraph Bullet: Indent: Left: 0.25", Numbered + Level: 1 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0.5" + Indent at: 0.75"

1. **ADVANCED MANUFACTURING**
   a. Manufacturing Cybersecurity
   b. Atomic Precision for Gaseous Separations
   c. Covetic Processing of Critical Materials and Strategic Materials
   d. Technology Transfer Opportunity: Electrochemical Recycling Electronic Constituents of Value (E-RECOV)
2. **BIOENERGY**
   ~~e.~~a. Cell-Free Biochemical Platforms to Optimize Biomass Carbon Conversion Efficiency
   ~~f.~~b. Reshaping Plastic Design and Degradation
   ~~g.~~c. Algae Engineering Incubator
3. **BUILDINGS**
   ~~h.~~a. Next Generation Residential Air Handlers
   ~~i.~~b. Novel Materials and Processes for Solid-State Lighting
   ~~j.~~c. Automated Point Mapping for Commercial Buildings
   d. Complementing Building Energy Modeling (BEM) with Non-Energy Analyses
   ~~k.~~e. Data Fusion for Building Energy Efficiency Projects
4. **FUEL CELLS**
   ~~l.~~a. Fuel Cell Membranes and Ionomers
   ~~m.~~b. Nozzles for High-Pressure, Low-temperature Gas Fills
   ~~n.~~c. Active Low Cost Thin Film Hydrogen Sensors
   ~~o.~~d. Smart Sensors for Structural Health Monitoring (SHM) of Composite Overwrapped Pressure Vessels (COPVs) of On-board Hydrogen Storage for Fuel Cell Electric Vehicles (FCEVs)
   ~~p.~~e. Innovative Concepts for Hydrogen Conversion to Liquid Hydrocarbon Fuels
5. **GEOTHERMAL**
   ~~q.~~a. Improved downhole telemetry for geothermal drilling
6. **SOLAR**
   ~~r.~~a. TECHNOLOGY TRANSFER OPPORTUNITY: Real-Time Series Resistance Monitoring in Photovoltaic Systems
   ~~s.~~b. TECHNOLOGY TRANSFER OPPORTUNITY: PV module Soiling Spectral Deposition Detector
   ~~t.~~c. Storage technologies to enable low-cost dispatchable solar photovoltaic generation
   ~~u.~~d. Hardened solar system design and operation for recovery from extreme events
   ~~v.~~e. Rural solar
   ~~w.~~f. Affordability, reliability, and performance of solar technologies on the grid
7. **VEHICLES**
   ~~x.~~a. Electric Drive Vehicle Batteries
   ~~y.~~b. SiC devices suitable for Electric Vehicle Extreme Fast Chargers
   ~~z.~~c. Reduction of Thermal and Friction Losses in Internal Combustion Engines
   ~~aa.~~d. Co-Optimization of Fuels and Engines
   ~~bb.~~e. Improving the Performance and Reducing the Weight of Cast Components for Vehicle Applications
   ~~cc.~~f. Low Cost, Lightweight, and High-Performance Fiber-Reinforced Composites for Vehicle Applications
8. **WATER**
   ~~dd.~~a. Microgrid for Improved Resilience in Remote Communities through Utilization of Marine Hydrokinetics and Pumped Storage Hydropower

~~ee.~~b. Ocean Energy Storage Systems
~~ff.~~c. Pumping and Compression using Marine and Hydrokinetic Energy
~~gg.~~d. High Value Critical Mineral Extraction from the Ocean Using Marine Energy

9. WIND

~~hh.~~a. Coordinated and Secure Distributed Wind System Control and Communications Technologies
~~ii.~~b. Remote Diagnostic Technologies to Reduce Offshore Wind Operating, Maintenance, and Repair Costs, and Increase System Reliability
~~jj.~~c. Other in Wind Turbine Blade Recycling

10. JOINT TOPIC: ADVANCED MANUFACTURING AND SOLAR ENERGY TECHNOLOGIES OFFICES

~~kk.~~a. Innovation in solar module manufacturing processes and technologies

11. JOINT TOPIC: ADVANCED MANUFACTURING AND GEOTHERMAL TECHNOLOGIES OFFICES

~~ll.~~a. Geothermal Desalination and Critical Material Recovery Systems
~~mm.~~b. Desalination and Critical Material Recovery Systems from Other Energy Sources

12. JOINT TOPIC: ADVANCED MANUFACTURING AND FUEL CELL TECHNOLOGIES OFFICES

~~nn.~~a. Advanced Materials for Detection and Removal of Impurities in Hydrogen

PROGRAM AREA OVERVIEW: OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

The Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) supports early-stage research and development of energy efficiency and renewable energy technologies that make energy more affordable and that strengthen the reliability, resilience, and security of the U.S. electric grid. DOE resources are focused on early-stage R&D and reflect an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies. EERE emphasizes those energy technologies best positioned to support American energy independence and domestic job-growth. ~~EERE's fiscal year 2019 budget request can be found here: https://www5.eere.energy.gov/office_eere/current_budget.php.~~

1. ADVANCED MANUFACTURING

Maximum Phase I Award Amount	(b) (5) $200,000	Maximum Phase II Award Amount	(b) (5) $1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Advanced Manufacturing Office (AMO) (https://energy.gov/eere/amo) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Manufacturing Cybersecurity

Manufacturing is most vulnerable to cyber-attacks and disruption to processes, rather than to data – and among manufacturing systems, industrial controls have been identified as most vulnerable. This issue is especially important for small and medium-sized manufacturing enterprises, which usually buy and use commercial control technology – and lack personnel dedicated to maintaining control system integrity.

Furthermore, many control systems in use in US manufacturing are older and are not easily upgraded due to cost and the need for a smaller manufacturer to maintain production without interruption.

This SBIR topic provides the opportunity for small businesses to work with industrial control developers, vendors, suppliers, standards organizations, and end users to investigate and develop cost-effective technology solutions to industrial control vulnerability. End users of special importance are small to medium-sized manufacturing enterprises that typically buy commercial control technology for their use and do not have the means to develop technology to ensure control security. Phase I~~1~~ grant applications for feasibility research are invited for the following subtopic areas:

- Encryption technology for digital control:- Many control loop signals are typically digitized at some point in manufacturing operations. D~~, d~~igital control is provided directly by Direct Digital Controllers DCC or Programmable Logic Controllers PLC. These controllers do not typically come with encryption technology, making digital signals susceptible to corruption. Phase I exploratory investigations for the development of digital control encryption technology are invited, especially for technology directed to legacy digital control circuitry that was not provided with encryption capability originally.
- Technology for redundancy checking in legacy control systems: -Manufacturing process corruption could appear as complete process disruption, or more insidiously through willful changes introduced almost imperceptibly over time. Phase I~~1~~ grant applications are invited for investigations in technology development for legacy control system integrity. Such technology is especially important for critical precision applications such as computer numeric controls applied in discrete parts manufacture.
- Wireless sensor signal encryption: -Most wireless sensors in industrial applications do not provide an encrypted signal to the control element or the controller. Those applications are vulnerable to willful disruption or ~~distortion.,~~distortion. Analog or digital encryption would protect the integrity of the control system. Phase I~~1~~ grant applications are invited for wireless sensor encryption technology, and it is expected that investigators will work with appropriate standards and communications authorities for technology development that can be commercialized successfully.

Questions – contact Brian.Valentine@ee.doe.gov

b. Atomic Precision for Gaseous Separations

(b) (5)

Atomically precise is defined as: -Materials, structures, devices, and finished goods produced in a manner such that every atom is at its specified location relative to the other atoms, and in which there are no defects, missing atoms, extra atoms, or incorrect (impurity) atoms. Thus, we are targeting extraordinary materials that are essentially defect free. As deposition processes cannot produce defect-free structures, the only currently available assembly method is to design molecules that self-assemble into defect-free molecular layers. Proposals for methods that do not synthesize membranes using molecular self-assembly will be declined without review. Graphene-based layered membranes are explicitly excluded and proposals for graphene membranes will not be considered to be responsive.

We seek to further advance the development of this new class of strong, thin, and atomically precise membrane materials for separations that provide a 10X permeance improvement over State-of-the-Art polymer membranes. They would have thicknesses generally below 10 nm for high permeance, incorporate atomically precise molecular pores for 100% selectivity, be atomically flat to prevent fouling, and heavily cross-linked for environmental stability. These membranes offer the potential to provide game-changing process energy advances.

The subtopic seeks proposals focused on the separation of gases. The separation of gases into high value products can be game changing for a variety of energy applications. In principle, a series of membranes of sufficient selectivity could separate air into its raw components of N2, O2, Ar, CO2, Ne, He, etc. for U.S. manufacturing of high value products at a competitive advantage. Helium could also be effectively separated from particular natural gas sources where it is concentrated (in the Great Plains, for example) without the need for energy intensive cryogenic treatment. Ethane and propane could be separated from natural gas at low energy cost and sold profitably without the need or infrastructure for cracking, and CO2 could be removed from natural gas with low energy consumption to improve its heating value. CO2 could also be recovered from combustion gases at the source and reused as carbon feedstock for transformation to high value hydrocarbons [1-4].

Responsive proposals will (a) provide evidence that the respondent has the experience and capability to design atomically precise membranes via molecular self-assembly, (b) outline the approach to the molecular design, (c) include milestones and deliverables for physics-based modeling of the membrane, and (d) ideally provide for some synthesis and testing of the design. Whether or not a fully functional membrane is proposed for Phase I, there should be some chemical synthesis component to test out a key aspect of the approach; that is, this is not intended to be a "paper" study only. As this is a novel approach to the separation of gases, wider system design issues may also arise; these may be included as part of a proposal, but the main emphasis must still be on the novel molecular design.

Questions – contact david.forrest@ee.doe.gov

c. Covetic Processing of Critical Materials and Strategic Materials

Covetic nanomaterials are metals in which a network of graphene ribbons and nanoparticles has been created using an electrical conversion process in liquid metal [1-5]. Unlike ordinary graphene, the covetic phase exhibits exceptional stability – it persists after remelting and it resists being burned off in the ASTM E1019 method for carbon analysis. Covetics can conduct heat and electricity more efficiently than conventional metals, and appear to be more oxidation resistant. Covetic nanomaterials are likely to be commercially important because the process is inexpensively scalable to tonnage quantities. This implies the potential for widespread usage in thousands of energy production, transmission, and storage applications, and to improve energy efficiency for U.S. manufacturing. Cross-cut: The process is of interest to the Advanced Manufacturing Office because it can be performed on a wide range of commercially important critical materials and strategic materials and because it represents a leading-edge opportunity for US manufacturers. Key technical hurdles need to be addressed and low volume high-value-added applications need to be identified and pursued to introduce covetics into commercial production. Areas of particular interest include:

- Application development: We seek advances in covetic alloy development for low volume, high value-added applications as an entrée to commercialization. This may involve critical materials such as rare

earths, strategic materials [6] such as lithium and hafnium, high value alloys, or precious metals. We would like to see the process performed on previously unexplored elemental metals and alloys that make commercial sense. The proposed development effort should identify the low volume, high value-added target alloy and application, quantify the commercial potential, specify a plan for conversion and chemical analysis, and include the thermophysical and mechanical property tests to be conducted. The composition and amount of physical material to be made should be explicitly proposed. The processing of that material should be explicitly proposed, including conversion parameter windows, and particularly thermomechanical deformation parameters and heat treatment. AMO recognizes that there are a limited number of laboratories with the capability to make these materials.; Aapplicants should already have some experience in working with covetic nanomaterials or be partnered with those with experience. Proposals with applicants claiming the ability to make covetics, without prior proof of conversion (including enhanced thermal and electrical conductivity), will be declined without review.

- Chemical analysis: We seek advances in the ability to inexpensively analyze the levels of converted and unconverted carbon in covetics. ASTM E1019 does not seem to be effective in measuring the covetic phase [3], and there is an unresolved controversy in this method's ability to distinguish converted vs. unconverted carbon. GDMS also does not seem to be effective. Carbon analysis using Energy Dispersive Spectroscopy on SEM samples is susceptible to chamber contamination, can be expensive, and cannot distinguish between converted and unconverted forms. -The same goes for XPS, with the additional problem of poor statistics from small sample size. Raman and EELS can detect the graphene form but cannot provide good statistics on bulk concentrations because of the small sample volumes being measured. DC PES requires a full analysis of all trace elements, may be highly inaccurate at low carbon concentrations, and cannot distinguish between converted and unconverted forms of carbon. Responsive proposals should include a systematic approach (and novel techniques) to determine total carbon, unconverted carbon, and converted carbon. Specific metallurgical alloys or elements should be proposed with a justification for the expected successful outcome. We seek novel techniques, perhaps taking advantage of unique strong binding between the metal matrix and nanocarbon phase. AMO recognizes that there are a limited number of laboratories with the capability to make these materials.; Aapplicants should already have some experience in working with covetic nanomaterials or work with those with experience in order to obtain reference samples.
- Process development: -Laboratory synthesis of covetics has proven to be less than straightforward, with inconsistent conversion yields and wide variations in resultant properties. Batch conversion methods will not necessarily scale well to continuous production methods, and a "re-invention" of the process may be required in that case. We seek proposals that address fundamental improvements to the conversion process based on known issues and principles of physics and process metallurgy. T; these issues should be made explicit in the proposal. Applicants should have appropriate IP positions and agreements in place to proceed with process innovations. Responsive proposals will provide a clear exposition of the fundamental process issue, why this is a problem, and how the proposed work will address the issue and improve and advance the capability of the covetic conversion process. Upgrades to equipment infrastructure will be considered as part of the proposed work. Proposed experiments to verify process improvements must include appropriate plans to measure improvements in conversion effectiveness. A design of experiments approach to optimize process parameters will not be considered responsive to this solicitation.

Questions – contact David.Forrest@ee.doe.gov

d. Technology Transfer Opportunity: Electrochemical Recycling Electronic Constituents of Value (E-RECOV)

About 60 percent of the eight million tons of electronic waste generated annually in the U.S. ends up in landfills. This electronic waste represents a significant feedstock of valuable base, precious and rare earth metals. Current electronic waste recycling efforts are primarily focused on only precious metal recovery. Processing facilities are located overseas where unsustainable acid leaching or toxic smelting processes are used, and in many cases lack environmental and worker safety controls. There is a growing need to employ safe, cost effective processes within the U.S. to capture all valuable (and in some cases strategic) materials from electronic waste streams. Such technologies enhance the security of the American people by limiting the dependence on foreign supplies of these materials while also creating new opportunities for American manufacturing.

Researchers at Idaho National Lab have developed a novel electrochemical process to safely dissolve non-ferrous metals from electronics leading to more complete recovery of recyclable materials while requiring up to 75 percent less chemical reagent than hydrometallurgical processes of comparable scale. The E-RECOV process efficiently recovers the base metals (copper, tin, zinc and nickel) thus allowing precious metals (silver, gold and palladium) to be recovered more efficiently using industry standard methods. The E-RECOV process continuously regenerates the initial oxidizer at the anode, giving the process solution a long life, resulting in significant savings in reagents and waste treatment. The result is reduced chemical use and production of multiple value products. There are options to recover rare earth elements if the feedstock contains appropriate content.

This Technology Transfer Opportunity seeks to leverage an electrochemical process and associated novel system of reactors to recover metals from electronic waste developed at Idaho National Lab, under funding from the Critical Materials Institute. The ideal candidate for this TTO opportunity will have an expertise in sourcing specific electronic waste such as printed circuit boards, knowledge of abrasive feedstock size reduction and processing and a knowledge of implementation of hydro and ~~electrometallurgy based~~electrometallurgy-based processes. The targeted outcome will be demonstration and scale up of the process to remove metals of value from electronic waste streams.

Idaho National Laboratory Information:
Licensing Information:
License type: Exclusive or Non-Exclusive, please include description of intended field of use in proposal.
Patent Status:

- U.S. Patent No. 9,777,346
  Methods for Recovering Metals ~~From~~from Electronic Waste, and Related Methods
  Issued October 3, 2017.
- U.S. Patent Application No. 15/690,717
  Methods for Recovering Metals ~~From~~from Electronic Waste, and Related Methods
  Filed October 30, 2017.

Questions – contact jonathan.cook@inl.gov and tara.gonzalez@ee.doe.gov

Subtopic a) References:

[1] Cybersecurity ~~For~~for Manufacturers: Securing the Digitized and Connected Factory. September 2017. https://cra.org/ccc/wp-content/uploads/sites/2/2017/10/MForesight-Cybersecurity-Report.pdf

[2] Cybersecurity Framework Manufacturing Profile. NISTIR 8183, September 2017.
https://nvlpubs.nist.gov/nistpubs/ir/2017/NIST.IR.8183.pdf
[3] Guide to Industrial Control Systems (ICS) Security. NIST Special Publication 800-82, May 2015.
https://nvlpubs.nist.gov/nistpubs/specialpublications/nist.sp.800-82r2.pdf

Subtopic b) References:

[1] Cohen-Tanugi, D., and Grossman, J.C., 2015, Nanoporous Graphene as a Reverse Osmosis Membrane: Recent Insights from Theory and Simulation, Desalination, Vol. 366, p. 59-70. http://www.rle.mit.edu/gg/wp-content/uploads/2016/03/04_NanoporousGraphene.pdf
[2] Assanis, et al., 2000, Study of Using Oxygen-Enriched Combustion Air for Locomotive Diesel Engines, Journal of Engineering for Gas Turbines Power, Vol. 123, Issue 1, p. 157-166.
http://gasturbinespower.asmedigitalcollection.asme.org/article.aspx?articleid=1421153
[3] Kurunov, I.E., and Beresneva, M.P., 1999, Effect of Enriching the Blast with Oxygen on the Production Cost of Pig Iron, Metallurgist, Vol. 43, Issue 5, p. 217-220. http://link.springer.com/article/10.1007/BF02466966
[4] Ramasubramanian, K., Verweij, H., and Ho, W.S.W., 2012, Membrane processes for carbon capture from coal-fired power plant flue gas: A modeling and cost study, J. Membr. Sci., 421-2 299-310
http://www.sciencedirect.com/science/article/pii/S0376738812005789

Subtopic c) References:

[1] Forrest and Balachandran, "Carbon Covetic Nanomaterials Show Promise," Advanced Materials & Processes, v. 175, no. 6, Sept. 2017, p. 30.
https://static.asminternational.org/amp/201706/files/assets/common/downloads/AMP_DigitalEdition_September.pdf
[2] Bakir and Jasiuk, "Novel metal-carbon nanomaterials: A review on covetics," Advanced Materials Letters, v. 8, no. 9, June 2017, p. 884-890.
https://www.researchgate.net/publication/317865542_Novel_metal-carbon_nanomaterials_A_review_on_covetics
[3] Forrest, et al., "Novel Metal-Matrix Composites with Integrally-Bound Nanoscale Carbon," Nanotech 2012, Santa Clara, CA, 18 June 2012. http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA559436
[4] U.S. Patent 8647534, Copper-carbon composition, https://patents.justia.com/patent/8647534
[5] U.S. Patent 9273380, Aluminum-carbon compositions, https://patents.justia.com/patent/9273380
[6] Defense Logistics Agency strategic materials:
http://www.dla.mil/HQ/Acquisition/StrategicMaterials/Materials/

Subtopic d) References:

[1] https://factsheets.inl.gov/FactSheets/8ERECOV.pdf
[2] LA Diaz, TE Lister, JA Parkman, GG Clark - Journal of Cleaner Production, 2016 – Elsevier
https://www.sciencedirect.com/science/article/pii/S0959652616301299
[3] TE Lister, P Wang, A Anderko - Hydrometallurgy, 2014 – Elsevier
https://www.sciencedirect.com/science/article/pii/S0304386X14001820

2. BIOENERGY

(b) (5)

Maximum Phase I Award Amount:	200,000	Maximum Phase II Award Amount	1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Bioenergy Energy Technologies Office (BETO) has a mission to help transform the nation's renewable and abundant biomass resources into cost-competitive, high-performance biofuels, bioproducts, and biopower. BETO is focused on forming partnerships with key stakeholders to develop and demonstrate technologies for advanced biofuels production from lignocellulosic and algal biomass as well as waste resources.

All applications to this topic must:

- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP and/or state of the art products or practices);
- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Provide a path to scale up in potential Phase II follow on work;
- Fully justify all performance claims with thoughtful theoretical predictions or experimental data;
- Be based on sound scientific principles (i.e. abides by the law of thermodynamics).

Grant applications are sought in the following subtopics:

a. Cell-Free Biochemical Platforms to Optimize Biomass Carbon Conversion Efficiency

The Bioenergy Technologies Office is interested in expanding the use of cell-free systems to further upgrade cellulosic sugars, lignin compounds, and other waste streams into biofuels and bioproducts. Cell-free biosynthesis technologies are a means of utilizing biocatalysts (enzymes) to perform complicated biochemical reactions that often cannot occur with industrial inorganic catalysts.- As a historical example, cell-free systems have been used to convert cellulose into glucose for the production of ethanol [1].

Cell-free biosynthesis technologies offer unique advantages compared to conventional microbial fermentations. -These include the ability to:

- D~~to d~~irect higher fractions of carbon to product as opposed to cell maintenance thereby increasing yield [2];
- O~~to o~~bviate the risk of producing or accumulating toxic intermediates to the cell [3];
- R~~to r~~educe capital costs and increase operational throughput by implementing novel reactor designs [4];
- C~~to c~~reate *de novo* synthesis pathways by "mixing and matching" of enzymes and/or lysates from different organisms [5].

Significant challenges exist prior to these types of technologies being expanded to the applications described above. -At the recent Cell-Free Synthetic Biology and Biocatalysis Listening Day (https://www.energy.gov/eere/bioenergy/cell-free-synthetic-biology-and-biocatalysis-listening-day), participants identified several key technical barriers that need to be overcome. These technical barriers, enzyme stability, cofactor regeneration, and novel enzyme production hosts and purification strategies, make up the three areas of focus for this subtopic. Applications to this subtopic should address only one of these focus areas in their proposal.

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Area 1, Enzyme stability: Enzyme stability represents a significant technical and economic hurdle to technology development in this space. Without enzymes or lysates that are stable on the order of weeks, significant fractions of carbon will otherwise be used in generating the biocatalysts required of these systems. If the enzyme(s) are being scaffolded, the enzyme stability should be demonstrated in this context.

Area 2, Cofactor Regeneration: Inherent to cellular fermentations is the need to balance reducing equivalents (NADH and NADPH) which is achieved through the conversion of pyruvate to Acetyl-CoA, ferredoxin reductases, etc. Equally important are methods to perform ~~adenosine triphosphate~~adenosine triphosphate (ATP) replenishment in the cell-free system. It is simply not economically feasible to supplement a cell-free system with these compounds, so they need to be sustained in-vitro. ~~[#]~~ Opgenorth [2] ~~et al. 2014~~ describes one such method of balancing these cofactors in order to have these available for subsequent enzymes.

Area 3, Novel enzyme production hosts and purification strategies: Current cell-free systems rely largely on the bulk production of enzymes using E. coli as a host. As such, the range of enzymes and lysates is limited to those that can be successfully heterologously expressed in E. coli.

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General Requirements:

- Proposed systems must utilize cellulosic sugars, lignin, or wet waste streams as the primary feedstock to produce biofuels or bioproducts. Proposed systems can also utilize biological intermediates as starting materials (e.g. acetate, pyruvate, butyrate, etc.).
- Applications must address the current state of the art for the production of their target biofuel or bioproduct. At a minimum they need to identify the titer, rate, and yield.
- Product yield calculations need to account for the substrate that is used to produce the purified enzymes and/or lysate.
- By the end of P~~p~~hase I, projects must have a strategy for eliminating the need for exogenous cofactors (e.g. ATP, NADH, etc.).
- Methods for enzyme purification from the original host must be considered as this can constitute significant costs.

Questions – contact david.babson@ee.doe.gov

b. Reshaping Plastic Design and Degradation

Plastics are a hallmark of modern life and consumer use of plastics is projected to grow over the coming decades, yet only about 2% of plastics like bottles are recycled into the same or similar-quality applications [1]. This subtopic will focus on two areas of R&D: Designing Plastics for a Circular Carbon Economy and Reimagining Plastic Degradation for Upcycling. Applicants should address only one of the R&D focus areas in their proposal.

Area 1: Designing Plastics for a Circular Carbon Economy
Modern plastics need to be designed and manufactured with recyclability in mind. Biobased feedstocks are well-suited for designing the plastics of the future due to their composition and structure. Unlike traditional feedstocks, which contain primarily carbon-carbon and carbon-hydrogen bonds, biobased feedstocks contain cleavable oxygen linkages which could be incorporated into the design of new plastics, essentially introducing "zippers" that allow for facile deconstruction at the end of the product's life [2]. In addition, biobased feedstocks can allow access to chemical structures which are not economical to access from petroleum,

potentially providing new avenues to access performance-advantaged materials with novel properties. The Department of Energy is seeking proposals targeting bio-derived plastics designed with end-of-life considerations in mind that can enable a circular carbon economy.

Other considerations include:

- Proposed systems must utilize bio-based feedstocks including lignocellulosic biomass, cellulosic hydrolysates, and other lignocellulose-derived intermediates. Feedstocks used for feed or food will be deemed unacceptable.
- Proposals must discuss end-of-life considerations and thoroughly explain the proposed material's advantages over petroleum derived materials. This includes methods to quantitatively characterize of the end-of-life properties of the proposed material.
- Proposals are encouraged to explore performance-advantaged plastics that in addition to superior end-of-life considerations can outperform traditional plastics for a specific, chosen application.

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Area 2: Reimagining Plastic Degradation for Upcycling

Only a small fraction of the 60 million ~~tonnes~~tons of plastic used in the United States is recycled, and an even smaller fraction is made into similar quality products as the original plastic, due to a loss in material properties during the recycling process [3]. The rest of plastic waste typically ends up in either landfills or the environment, causing ecological damage. Better methods are needed to address the large waste-disposal problem presented by currently used plastics. This topic will focus on ways to remake our current systems for plastic disposal and recycling with a focus on utilizing an array of plastics as feedstocks for value-added applications. The Department of energy is seeking proposals exploring challenges in selective C-O, C-N, and C-C chemistry, crystallinity, feedstock contamination, breakdown rate, and other innovative ideas to address difficulties with plastic degradation and upcycling. Proposals are encouraged to target systems with low energy requirements as opposed to systems like gasification which have previously been thoroughly investigated for these feedstocks [4].

Other considerations include:

- Proposed systems must target waste plastic streams including but not limited to polyethylene, polypropylene, polystyrene, polyethylene terephthalate, ~~polyurathanes~~polyurethanes, nylons, polyamides, and polylactams.
- Proposals are encouraged to target mixed or contaminated waste plastic streams with their eventual system configurations, though this is not required for Phase I.
- Proposals are encouraged to target value-added output streams, for example compounds that are more valuable than mixed polymer-derived monomer streams, though this is not required.
- Chemical and biological processes are both of interest.

Questions – contact jay.fitzgerald@ee.doe.gov

c. Algae Engineering Incubator

BETO's Advanced Algal Systems subtopic, "Algae Engineering Incubator" is intended to identify potentially impactful ideas that are not meaningfully addressed in the subprogram's project portfolio. The subtopic will be open to all applications that propose the development of technologies that facilitate the goals of the Advanced Algal Systems R&D subprogram through non-biological, engineering approaches. Applicants can

review the 2017 Peer Review [1] and 2015 Peer Review [2] reports to identify what non-biological, engineering R&D has already been funded in the portfolio.

The scope for this subtopic is intentionally broad. Examples of proposals that fit this subtopic are the development of equipment that improves laboratory experimental throughput or data quality, the creation of technologies that assist in monitoring and automation of cultivation, and the testing of new materials to reduce the capital expenses of cultivation systems.

Applicants should clearly describe how they will meet the Advanced Algal System's goals or how success of their project will facilitate the success of performers in BETO's algae portfolio.

Applications specifically **not** of interest:

- Applications that propose to conduct R&D that was the primary focus of previous funding opportunities. Examples of work supported by previous funding opportunities are:
    - Recovery of nutrients from conversion to recycle back to cultivation;
    - Development of harvest/processing technology;
    - Development, characterization, and valorization of finished biofuels and bioproducts from algal biomass;
    - Research on biological improvements, including engineering of strains and cultivation ecology;
    - Research on increasing carbon utilization efficiencies of algal cultivation as well as on developing direct air capture technologies.
- Applications that propose to develop technology that relies on purely heterotrophic algae cultivation.
- Applications that propose mixotrophic algae cultivation strategies that utilize food-based sugars (i.e., derived from food-based crops including but not limited to corn, beets, sorghum, and sugar cane).
- Applications that propose to develop technology for the artificial lighting-based cultivation of algae for energy products (other than as an enabling tool for high throughput laboratory-based screening).
- Applications that propose to work on biomass other than algae biomass (e.g. lignocellulosic biomass, non-algae microorganisms, fungi, etc.).

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Questions – contact devinn.lambert@ee.doe.gov

Subtopic a) References:

[1] National Renewable Energy Laboratory. 1993. "'Mini-Manhattan Project' for Cellulases". https://www.nrel.gov/docs/legosti/old/5676.pdf
[2] Opgenorth et al. 2014. "A synthetic biochemistry molecular purge valve module that maintains redox balance." Nat. Commun. doi: 10.1038/ncomms5113.
[3] Opgenorth et al. 2017. "A molecular rheostat maintains ATP levels to drive a synthetic biochemistry system." Nat. Chem Biology. doi: 10.1038/nchembio.2418
[4] Nussbaumer et al. 2017. "Bootstrapped biocatalysis: biofilm-derived materials as reversibly functionalizable multienzyme surfaces." ChemChem. doi.org/10.1002/cctc.201701221
[5] Dudley et al. 2016. "Cell-free mixing of Escherichia coli crude extracts to prototype and rationally engineer high-titer mevalonate synthesis." ACS Synth. Biol. DOI: 10.1021/acssynbio.6b00154

Subtopic b) References:

[1] S. Lemonick. Chemical and Engineering News. 96, 25 (2018)

[2] S. Lemonick. Chemical and Engineering News. 96, 25 (2018)
[3] J.M. García J, M.L. Robertson, M. Science. 358, 6365 (2017)
[4] A. Rahimi, J. M. García. Nat. Rev.Chem. 1, 0046 (2017).

Subtopic c) References:

[1] U.S. Department of Energy, Bioenergy Technologies Office, 2017 Project Peer Review. Retrieved September 5, 2018, from https://www.energy.gov/eere/bioenergy/peer-review-2017
[2] U.S. Department of Energy, Bioenergy Technologies Office, 2015 Project Peer Review. Retrieved September 5, 2018, from https://www.energy.gov/eere/bioenergy/peer-review-2015

3. BUILDINGS

Maximum Phase I Award Amount: (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

Residential and commercial buildings account for more than 40% of the nation's total energy demand and 70% of electricity use, resulting in an annual national energy bill totaling more than $380 billion [1, 2]. The U.S. Department of Energy's Building Technologies Office (BTO) (http://energy.gov/eere/buildings) is working in partnership with industry, academia, national laboratories, and other stakeholders to develop innovative, cost-effective energy saving technologies that could lead to a significant reduction in building energy consumption and enable sophisticated interactions between buildings and the power grid. BTO's goal is to reduce aggregate building energy use intensity by 45% by 2030, relative to the consumption of 2010 energy-efficient technologies. The rapid development of next-generation building technologies are vital to advance building systems and components that are cost-competitive in the market, to meet BTO's building energy use reduction goals, and lead to the creation of new business and industries. Moreover, by cutting the energy use of U.S. buildings by 20%, the American people could save approximately $80 billion annually on energy bills. And, money saved on energy costs flows to other sectors of the economy, which can lead to the creation of new jobs.

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for cost and/or performance improvements that are tied to clearly defined baseline and/or state of the art products or practices;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include an energy savings impact and/or impact on building-to-grid interaction as well as a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or experimental data.

Grant applications are sought in the following subtopics:

a. Next Generation Residential Air Handlers

According to ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers), an air handler, or air handling unit (AHU), is a Heating, Ventilation and Air-conditioning (HVAC) device that regulates and circulates air. BTO seeks to accelerate the development of the next generation Heating, Ventilation, Air-conditioning, and Refrigeration (HVAC&R), water heating and appliance technologies. -HVAC&R technologies consume more than half of the total energy used in U.S. residential and commercial buildings [1]. -HVAC alone is the largest energy end-use for U.S. buildings, consuming approximately 40% (15.5 Quads) of total energy in 2015. BTO has published several reports on the energy savings potential and RD&D Opportunities for both Residential and Commercial Building HVAC Systems [2]. These reports document energy efficiency improvements in residential HVAC systems but show a lack of improvement in residential AHUs which have mostly stayed the same in shape, form, utility and efficiency. These reports highlight some of the emerging technologies that could be used in future air handlers. BTO is seeking new technologies like those highlighted in the BTO reports that can radically enable a transformative change in the design, manufacturability, maintenance/service, performance, and energy savings from these next generation residential AHUs.

Today's residential air handlers used in central air conditioners and heat pumps systems typically look like large rectangular metal box and have for several decades. These air handlers physically connect to a home's ventilation system that distributes the conditioned air through the home with the responsibility of delivering comfort to its residents. These units are manufactured at a factory and final installation is done onsite by joining these components together and mating them to a building's duct system. Most residential air handlers include several major components including a blower (with an electric motor), an evaporator/condenser coil (heat exchanger) if a heat pump system, a furnace section if using natural gas to heat a home, and an evaporator coil for cooling if it is also an air conditioning system. Today these major components are optimized as independent components. A transformative change in air handler design will require that these components instead be optimized as a system.

BTO is seeking to develop the next generation of air handlers that are more than just better motor designs, but also new system configuration based on advanced computational fluid dynamics (CFD) modelling that addresses the problem holistically (e.g. relationship of fans with other subcomponents, etc.), and enables the next generation of air handlers and of residential HVAC technology overall. The focus is on innovative solutions that can reduce the energy consumption of an air handler or AHU by a minimum of 25%, enhance the overall performance of the HVAC system greater than 5% (heating and/or cooling modes), and enable potential new system configurations and heat exchanger designs. These designs and solutions also include natural gas or fuel-fired solutions.

Most of these system's energy efficiency measures utilize a seasonal energy efficiency ratio (SEER in British thermal units per Watt-hour (Btu/Wh)), and the heating seasonal performance factor (HSPF in British thermal units per Watt-hour (Btu/W-h)). For this solicitation, these metrics should be used to justify all system energy efficiency claims. Given the wide range of units and sizes in the field, the applicant is required to pick a representative unit as the baseline state-of-the-art (SOA) unit and make all efficiency and performance claims based on that representative unit. Please justify the SOA unit and why it makes sense for your claims and the rationale behind its choice. -While proposals are sought that focuses on residential air handlers, it is expected that some of these innovations could potential impact commercial AHUs as well. Applicants should capture these benefits and others if relevant.

Given the wide range of air handlers suitable for this subtopic, specific cost targets are not defined but should be cost neutral for the overall system design. However, applications should still report out the expected costs

of the proposed system configuration, providing analysis to support all claims made. Applications must clearly state how the following targets will be met:

Next Generation Residential Air Handlers Targets	
Energy Efficiency	≥ 25% decrease in the energy consumption of an air handler or AHU *and* enhance the overall energy efficiency performance of the HVAC system ≥ 5% (heating and/or cooling modes)
Physical size	≤ 10% greater than state-of-the-art designs
Required cleaning intervals, or difficulty of cleaning, to maintain as-new performance	Little to no increase as compared to state-of-the-art designs, should improve system reliability
Susceptibility to damage or corrosion or performance degradation during manufacture, assembly, transportation, installation, or use	Little to no increase as compared to state-of-the-art designs for relevant applications
First Cost, system	No increase as compared to state-of-the-art system designs

Questions – Contact: Antonio M Bouza, antonio.bouza@ee.doe.gov

b. Novel Materials and Processes for Solid-State Lighting

There are numerous fundamental advancements of materials and process that are applicable to energy saving technologies of interest to the DOE that address high priority research needs such as energy storage, critical materials usage, efficient manufacturing, etc. -Within EERE's Building Technologies Office (BTO), there are few other opportunities capable of achieving the remarkable energy saving potential promised by solid-state lighting (SSL) [1]. -Today, SSL has begun to transform the general illumination landscape in a very significant and energy efficient manner, it is believed that only about 10% of the total energy conserving potential of SSL has been realized using currently available technologies. -To achieve the goal of reducing domestic energy consumption of general illumination 50% or more through SSL, many innovative and technology breakthroughs are required in manufacturing processes, control systems, device architectures and constituent materials that are the subject focus of this subtopic [2]. Due to the tremendous breadth of the materials advancements required throughout the SSL landscape, this broad subtopic is described in three more narrow categories of novel materials needs or areas of interest. -Only proposals that address these specific materials-related opportunities will be considered here.

Inorganic Light Emitting Diode (LED) Materials:

Considerable research and materials development ~~has~~have been applied towards overcoming the well-known droop in III-Nitride Light-Emitting Diode (LED) efficiency with longer wavelengths particularly in the green and amber wavelength regimes [3]. Often referred to as the "Green-Gap", BTO has systematically advanced the basic understanding of the fundamental mechanisms that dictate efficiency and droop by sponsoring early-stage research in this area over the past decade. -The result has been a more comprehensive scientific understanding of the fundamental mechanisms but there remains a need for early-stage R&D to distill this knowledge to advance new and novel emitter materials and the processes used to efficiently and cost effectively manufacture them with reduced droop performance and spectral characteristics suited for general lighting applications.

Another area that has received investment by BTO is high-efficiency wavelength conversion materials and processes commonly referred to as downconverters. -While most materials development has been focused on

production of warm-white LEDs using existing Yttrium Aluminum Garnet (YAG)-based phosphors, other promising wavelength conversion materials and process have been developed recently including those that do not depend on critical materials such as Rare Earth Elements. -Other examples include nanocrystals [4] and quantum dots [5] made with a variety of constituent materials. -While promising, many of these candidate solutions still have challenges with poor thermal stability and non-uniform performance over long lifetimes. They also suffer from and high cost to manufacture or incorporate into device designs that are competitive and compatible with LED architectures that are widely used in high brightness lighting applications today. Thus, there remains a considerable opportunity for government sponsored research in alternative downconversion solutions that meet the quantum yield, thermal stability, spectral performance, color consistency and optical flux saturation requirements with a new and potentially simpler manufacturing process.

Organic Light Emitting Diode Materials:

Organic Light Emitting Diode (OLED) efficiency is limited by many factors that require breakthroughs in constituent materials. -Among the most significant materials and manufacturing process related needs are 1) high efficiency yet stable blue emitter materials, 2) high performance electrically conductive layers with superior visible light transmission properties, and 3) device encapsulating or integrated substrate materials. Considerable research has already been completed in each of these areas with varying levels of success [4]. Many of these new and novel materials advancements have been proven in laboratory experiments but have not met the simultaneous requirements of long lifetime, inexpensive manufacture and significant performance advancement. Innovative and novel solutions to this significant materials and process challenges are welcome in this area.

An important example of a novel materials need is conductive materials of advanced composition and design that perform multiple functions such as being highly transparent and electrically conductive. -In contemporary OLEDs, efficient operation depends on superior charge introduction into various photonic layers yet whose optical transmission at wavelengths of practical value is simultaneously very high. -These contradictory performance requirements are typically satisfied using Transparent Conducting Oxides (TCOs). -Indium Tin Oxide (ITO) possessing an In:Sn atomic ratio of about 10:1, is the most common TCO coating used to manufacture OLED anodes in generic bottom-up deposited layer device designs. -ITO is not, however, an ideal anode material for high efficiency OLEDs [4]. It has: inappropriate work function, difficulty in creating desired patterns, poor thermal stability, integration and bending on flexible substrates. -It also requires high quality Indium and must be processed at high temperatures. -All these factors limit the ~~high speed~~high-speed manufacture of integrated ITO substrates. -While considerable research towards identification of alternative materials or structures for OLED anodes has been completed to date [4], there appears to be only limited commercial success. -Therefore, in addition to proposed novel and unproven materials solutions to this challenge, advancement of known alternatives or processes are welcome in this area.

Optical Materials for High Efficiency Luminaires:

By their very definition, all high efficiency SSL technologies used in buildings must operate best within the visible portion of the electromagnetic spectrum. -This creates special encapsulation or packaging challenges for both LED and OLED designs. -At the device or light engine level, new materials and encapsulation methodologies must manage the refraction index to improve light extraction from these devices. New materials or alternative to conventional materials such as silicone composites, glass, or polymers that are both stable and inexpensive are needed. -This area includes the development of new and novel optical materials or

matrices applicable to either LEDs or OLEDs and may be intended for either internal or external extraction efficiency improvement. -Viable candidate approaches may incorporate other constituent materials such as downconverters for example, along with a proposed optical advancement that is novel or innovative.

Luminaires intended for use with SSL sources are typically designed based on their older counterparts that used a legacy lighting technology such as linear or compact fluorescent lamps. -This common practice, while being easy and inexpensive to implement, has limited the market penetration of efficient luminaires for a variety of reasons. -Arguably, the most significant is the limited availability of inexpensive, lightweight, and easy to manufacture optical materials that manage either the directional distribution of light from an LED or the diffuse light produced from an OLED better than the traditional material used with legacy lamp types. Materials that control light efficiently produced within the luminaire or to create beam profiles that are more easily and efficiently controlled are needed. -Novel materials and optical designs that meet these performance challenges at competitive manufacturing costs and complexity are sought under this subtopic. -Viable proposals to this subtopic may include integration of other functionality such as variable beam profiles, downconverters, or methods used to manufacture them.

Summary:

Irrespective of the technical approach proposed to meet one or more of the above areas of interest, all successful proposals must demonstrate that the enabling research completed under this effort will succeed in producing the predicted performance advancement and reduction of technical risk required to move to successive stages of research. -The proposed Phase I effort should be designed to retire significant technical risk and make proof of principle of the proposed approach. Phase II may continue to develop the approach but the fundamental question of penultimate price and performance of the proposed innovation should be well documented and clear in the Phase II proposal. -The primarily benefit of the research proposed under this topic must be aligned with the price and performance goals described in the SSL Research and Development Plan [2].

Questions – contact James R. Brodrick, james.brodrick@ee.doe.gov

c. Automated Point Mapping for Commercial Buildings

One of the major barriers to the implementation of advanced data analytics (e.g., automated fault detection and diagnostics or AFDD) and controls software can be the laborious and expensive process of tagging and mapping individual points that correspond to sensors, actuators, and controllers located throughout a building. This long process limits the affordability of emerging analytics engines or software applications under development for optimizing building energy management, and ultimately, BTO's programmatic energy savings performance goals achieved through innovations in sensor and control technologies [1]. These technologies also form a fundamental backbone for optimizing grid services from buildings in modernizing the grid.

The challenge is especially pronounced for large commercial buildings due to the large number of points involved.- Assuming one minute for identifying and commissioning each point, for example, should require 833.3 labor hours for a building consisting of 50,000 points [2]. -Retrofit applications become even more complex due to inconsistent, mislabeled, or customized labeling of points associated with previously installed building automation systems (BAS) from different vendors, manufacturers, and installers. -Furthermore,

standardized point names do not include all metadata or descriptive information about a point (e.g., sensor placement location) necessary for mapping. -Manual assignment of semantics or meaning to distinguish points is also time-consuming and subject to error. -Standardized protocols (e.g., BACnet [3], LONWorks) to enable communications and automate the detection and identification process, consistent and harmonized naming conventions, semantic data models, and taxonomies or schema (e.g., Project Haystack [4], Building Information Models, Ontologies) are necessary and in development. -Limitations exist in terms of completeness, including the ability to capture uncertainty [5, 6]. This is being addressed through techniques to automate the conversion of data from existing buildings [7, 8], as well as the development of a schema that includes an open reference implementation standard for evaluation of its effectiveness [9, 10]. -Solutions are also being developed using machine learning to reduce the manual mapping process by automatically inferring names and data through statistical models that exploit patterns or correlations of points [11, 12, 13, 14, 15].

Leveraging these advancements, BTO is specifically interested in the development of innovative, early-stage algorithmic solutions to remaining technical issues for point identification that are not being currently addressed in the approaches described, such as identification of errors in existing/new point names, identification of physical location of points, and any other issues not mentioned above. These solutions should leverage and complement industry-driven protocols, as well as taxonomies and schema under development to the best extent possible. Algorithms developed in Phase I should include proof of concept validation that can be transitioned into a field testing and validation in Phase II that can inform development of commercialized product through follow-on private sector investment.

Questions – Contact: Marina Sofos, marina.sofos@ee.doe.gov

d. Complementing Building Energy Modeling (BEM) with Non-Energy Analyses

Whole-building energy modeling is just one type of analysis that informs building energy efficiency projects such as design, operation, green certification, and code and program development and implementation. Other types of analyses include life-cycle analysis, daylighting, indoor and outdoor environmental quality and thermal comfort, urban microclimate, cost and other project or building related financial metrics, water ~~resiliency~~use, resiliency, and others. These analyses can often leverage data that is available for – or produced by – whole-building energy analysis. Some can, in turn, inform or enhance whole-building energy analysis.

BTO is seeking proposals for methods and tools that complement whole-building energy analysis and leverages energy analysis, its inputs, outputs, or both, to drive complementary analyses or vice versa. Proposals may use open-source BTO-funded tools such as EnergyPlus and OpenStudio, but are not required to do so. Proposals may also leverage BTO-funded data repositories such as the Building Performance Database (BPD) and the Standard Energy Efficiency Platform (SEED), but are not required to do so. Where applicable, proposals are encouraged to use open data exchange schema such as BuildingSync, HPXML, and CityGML.

The expected output of a successful Phase I project is a working prototype of a new or enhanced analysis that is relevant to building projects and usable by "power users". Applicants are encouraged to identify a small group of such power users to help provide feedback and demonstrate the utility and relevance of the analysis. Successful Phase I projects should be ready to apply for either private funding or Phase II awards that will focus on scaled-up market-ready solutions.

Questions – Contact: Amir Roth, amir.roth@ee.doe.gov

e. Data Fusion for Building Energy Efficiency Projects

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Data standardization is one of many barriers to the effective implementation of energy efficiency programs and projects. Lack of standardization makes it difficult to aggregate multiple data-sets that provide similar information about different sets of buildings into a single larger set that can support more robust analysis. More significantly, it prevents "fusion" of data-sets that provide different information about the same set of buildings to create new analyses. Over the past several years, BTO has invested in a number of standards and technologies intended to address these issues, streamline existing applications, and enable new applications. Standards include the Unique Building Identifier (UBID), the BEDES data dictionary, and the BuildingSync and Home Performance XML building energy schema. Tools include the Building Performance Database (BPD), the Standard Energy Efficiency Data (SEED), and the Audit Template.

BTO is seeking proposals that leverage these open data standards, schema, platforms and repositories (as well as others such as CityGML, EnergyADE, and GreenButton) and use modern data fusion and science techniques to develop new and enhanced analytical capabilities that lower barriers to engagement and transaction costs of energy-efficiency projects at the scale of individual buildings or entire building stocks. Examples applications include but are not limited to: 1) energy-efficiency services for building operators, tenants, and large-portfolio owners. 2) energy efficiency program development and implementation; 3) effectiveness and impact assessment of new technologies and operational strategies. In addition to energy-efficiency, proposals may also address areas that are of more recent interest to BTO, including demand reduction, demand flexibility and the ability of buildings to provide grid services, critical water issues, and resiliency.

The expected output of a successful Phase I project is a working prototype of a new or enhanced analysis that is relevant to building projects and usable by "power users". Applicants are encouraged to identify a small group of such power users to help provide feedback and demonstrate the utility and relevance of the analysis. Successful Phase I projects should be ready to apply for either private funding or Phase II awards that will focus on scaled-up market-ready solutions.

Questions – Contact: Amir Roth, amir.roth@ee.doe.gov

References:

[1] U.S. Energy Information Administration. Natural Gas Summary from 2012 – 2017. Washington, DC: U.S. Department of Energy, Release date: July 31, 2018. Accessed August 30, 2018: https://www.eia.gov/dnav/ng/ng_sum_lsum_dcu_nus_a.htm

[2] U.S. Energy Information Administration. Electric Power Monthly with Data for December 2016. Washington, DC: U.S. Department of Energy, February 2017. https://www.eia.gov/electricity/monthly/archive/february2017.pdf

Subtopic a) References:

[1] U.S. Energy Information Administration. Annual Energy Outlook 2014 with Projections to 2040. DOE/EIA-0383(2014). Washington, DC: U.S. Energy Information Administration, 2014.

[2] http://www1.eere.energy.gov/buildings/pdfs/residential_hvac_research_opportunities.pdf & http://www1.eere.energy.gov/buildings/pdfs/commercial_hvac_research_opportunities.pdf

Subtopic b) References:

[1] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2017, SSL Forecast Report, (https://www.energy.gov/eere/ssl/ssl-forecast-report)
[2] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Solid-State Lighting 2017 Research & Development Plan, (https://www.energy.gov/eere/ssl/downloads/solid-state-lighting-2017-rd-plan-suggested-research-topics)
[3] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2018, LED R&D Projects (https://www.energy.gov/eere/ssl/listings/led-rd-projects) and OLED R&D Projects (https://www.energy.gov/eere/ssl/listings/oled-rd-projects)
[4] Y. Shirasaki et al., "Emergence of colloidal quantum-dot light-emitting technologies," Nature Photonics 7, 13 (2013).
[5] Palomaki, Peter, "Quantum Dot Downconverters for SSL", DOE SSL R&D Workshop January 29-31, 2018, Nashville, TN, https://www.energy.gov/sites/prod/files/2018/02/f48/palomaki_qd-downconverters_nashville18_0.pdf

Subtopic c) References:

[1] Sofos, M., Langevin, J.T. (2018). Laying Down the Foundation: An R&D Roadmap for Energy Savings through Advancements in Smart Buildings Technologies," 2018 ACEEE Summer Study on Energy Efficiency in Buildings.
[2] Park, Y. (2012). Point Naming Standards: A Necessary Evil for Building Information Integration. ISA Automation Week: Control Performance, pp. 37-49. International Society of Automation, Research Triangle Park, NC.
[3] http://www.bacnet.org
[4] https://project-haystack.org
[5] Bhattacharya, A. A., Ploennigs, J., Culler, D. (2015). "Short Paper: Analyzing Metadata Schemas for Buildings – The Good, ~~The~~the Bad, and the Ugly," BuildSys '15.
[6] Schumann, A. et al., (2014). "Toward Automating the Deployment of Energy Savings Approaches in Buildings," BuildSys.
[7] Balaji, B., ~~et.al.,~~et.al. (2015). "Organizing large deployment of sensors to create reusable applications for buildings," BuildSys '15, 13-22.
[8] Bhattacharya, A. A., Hong, D., Culler, D., Ortiz, J., Whitehouse, K., Wu, E. (2015). "Automated metadata construction to support portable building applications." BuildSys '15, 3-12.
[9] http://brickschema.org
[10] Balaji, B., et al., (2016). "Brick: Towards a Unified Metadata Schema ~~For~~for Buildings," BuildSys '16.
[11] Schumann, A. et al., (2014). "Toward Automating the Deployment of Energy Savings Approaches in Buildings," BuildSys.
[12] Hong, D., Wang, H., Ortiz, J., Whitehouse, K., (2015). "The building adapter: Towards quickly applying building analytics at scale." BuildSys '15, 123-132.

[13] Ortiz, J., Dezhi, H., Whitehouse, K., Culler, D. (2013). "Towards automatic spatial verification of sensor placement in buildings," Proceedings ~~fo~~of the 5th ACM Workshop on Embedded Systems for Energy-Efficient Buildings.
[14] Koc, M., Akinci, B., Berges, M. (2014). "Comparison of linear correlation and statistical dependency measure for inferring spatial relation of temperature sensors in buildings," BuildSys '14.
[15] Gao, J., Ploennings, J., Berges, M. (2015). "A data-driven meta-data inference framework for building automation systems." BuildSys '15, 23-32.

4. FUEL CELLS

Maximum Phase I Award Amount (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Fuel Cell Technologies Office (FCTO)~~)~~ [1] is a key component of the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) portfolio. The central mission of FCTO is to stimulate the U.~~S.~~S. economy and global competitiveness by reducing dependence on foreign oil imports and establishing a domestic power and fuel industry using efficient, reliable clean energy technologies through early stage research and technology development. To achieve this goal, FCTO invests in early-stage, innovative technologies that show promise in harnessing American energy resources safely and efficiently. Fuel cells can address our critical energy challenges in all sectors - commercial, residential, industrial, and transportation.~~"~~

Fuel cell electric vehicles (FCEVs) using hydrogen can achieve significantly higher efficiencies than combustion engines resulting in overall less energy use. Hydrogen can be produced from diverse domestic resources, such as natural gas, oil, coal, and biomass, as well as from renewables using methods such as direct or indirect water splitting. In addition to transportation applications, hydrogen and fuel cell technologies can also serve stationary application ~~– s~~—i.e. providing responsive back-up power and other electric and fuel distribution services improving energy security and reliability. Thus, fuel cell and hydrogen technologies enable American energy dominance by safely and efficiently harnessing domestic resources.

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FCTO addresses key technical challenges for both fuel cells and hydrogen fuels (i.e., hydrogen production, delivery and storage). Light duty FCEVs are an emerging application for fuel cells that has earned substantial commercial and government interest worldwide due to the superior efficiencies, reductions in petroleum consumption, and reductions in criteria pollutants possible with fuel cells. Recent analyses project that, if DOE cost targets for FCEVs are met, U.~~S.~~ petroleum consumption can be reduced by over one million barrels per day~~3~~. FCEVs reduce petroleum consumption by about 95% in comparison to conventional light duty vehicles when the hydrogen is produced from natural ~~gas~~gas [2]. The areas identified in this topic will enable progress toward commercializing light duty FCEVs.

Grant applications are sought in the following subtopics. Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);

- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

a. Fuel Cell Membranes and Ionomers

Polymer electrolyte membrane (PEM) fuel cells are a leading candidate to power zero emission vehicles, with several major automakers already in the early stages of commercializing fuel cell vehicles powered by PEM fuel cells. PEM fuel cells are also of interest for stationary power applications, including primary power, backup power, and combined heat and power. Commercial PEM technology typically is based on perfluorosulfonic acid (PFSA) ionomers, but these ionomer materials are expensive, particularly at the low volumes that will be needed for initial commercialization. Non-PFSA PEMs, including those based on hydrocarbon membranes, represent a lower-cost alternative, but government sponsored R&D is needed to improve non-PFSA's relatively low performance and durability.

Development of novel hydrocarbon and other ionomers, including non-PFSA PEMs suitable for application in fuel cells is solicited through this subtopic. Novel PEMs developed through this subtopic should have all properties and characteristics required for application in PEM fuel cells for transportation applications, including:

- High proton conductivity in a range of temperature and humidity conditions;
- Good film forming properties enabling formation of thin (<10 μm) uniform membranes;
- Low swelling and low solubility in liquid water;
- Low creep under a range of stress, temperature, and humidity conditions;
- Low permeability to gases including H2, O2, and N2;
- Chemical and mechanical durability sufficient to pass the accelerated stress tests.

The goal of any proposed work under this subtopic should be to produce a PEM using an affordable and durable ionomer that can meet or exceed all of the 2020 technical targets simultaneously in the table below. PEM technology proposed for this subtopic should be based on non-PFSA ionomers, but may include reinforcements or other additives.

Membrane samples should be tested at an independent laboratory at the end of each phase. Phase I should include measurement of chemical and physical properties to demonstrate feasibility of concurrently meeting or exceeding the targets below related to these parameters, while Phase II should address long term durability and development of manufacturing processes to meet the cost targets.

Technical Targets: Fuel Cell Membranes for Transportation Applications Excerpted from [1]

Characteristic	Units	2020 Targets
Maximum oxygen crossover	mA / cm²	2
Maximum hydrogen crossover	mA / cm²	2

Area specific proton resistance at:		
Maximum operating temperature and water partial pressures from 40–80 kPa	Ohm cm²	0.02
80°C and water partial pressures from 25–45 kPa	Ohm cm²	0.02
30°C and water partial pressures up to 4 kPa	Ohm cm²	0.03
-20°C	Ohm cm²	0.2
Maximum operating temperature	°C	120
Minimum electrical resistance	Ohm cm²	1,000
Cost[d]	$ / m²	20
Durability		
Mechanical	Cycles until >15 mA/cm² H_2 crossover	20,000
Chemical	Hours until >15 mA/cm² crossover or >20% loss in OCV	>500
Combined chemical/mechanical	Cycles until >15 mA/cm² crossover or >20% loss in OCV	20,000

Questions – Contact: Donna Ho, Donna.Ho@ee.doe.gov

b. Nozzles for High-Pressure, Low-temperature Gas Fills

The cost and reliability of nozzles for dispensing of hydrogen into light duty fuel cell vehicles is currently a critical barrier to the viability of hydrogen infrastructure. Hydrogen dispensers currently account for 35% of unscheduled maintenance events at stations, and design flaws are one of the most common causes of nozzles losing functionality [1]. Innovations in manufacturing techniques for nozzles could reduce their capital costs, improve the reliability of fueling stations, reduce leakage of hydrogen, and ensure domestic leadership in the emerging area of hydrogen infrastructure. Domestic stakeholders in related industries, such as suppliers of compressed natural gas (CNG) components, may be particularly well-positioned to leverage existing technologies in R&D on hydrogen fueling.

Proposals are sought for the development of hydrogen fueling nozzles for use at high-throughput stations (80% utilization) for light-duty vehicles, using filling methods compliant with the Society of Automotive Engineers (SAE) J2601 fueling protocol [2]. Nozzles should be capable of incorporating station-to-vehicle communications technologies that are currently in use (e.g. infrared communication between the vehicle and the fueling station), or being considered for use in future stations (e.g. wireless communication). Phase I of the proposed work may include evaluation of advanced materials, manufacturing techniques (e.g. additive manufacturing), or designs for nozzles, along with down-selection of one concept for further evaluation. Phase II may include development of a nozzle prototype, experimental verification of prototype performance, and techno-economic analysis of nozzle cost. Nozzle concepts proposed must target~~be capable of~~: 1)

hydrogen fills per flow rates, temperatures, and pressures specified in the SAE J2061 protocol, 2) a service life of at least 25,550 fills/year for 10 years, and 3) a capital cost of $7,000 or less for nozzles, not including the cost of communications components.

Questions – Contact: Neha Rustagi, Neha.Rustagi@ee.doe.gov

c. Active Low Cost Thin Film Hydrogen Sensors

Hydrogen gas is used in a variety of sectors today (e.g. oil refining, coal power plants, fueling stations for fuel cell vehicles), and safe operation requires the ability to rapidly detect and contain leaks. -Approaches currently used for leak detection include monitoring of drops in pressure, along with use of thin films with chemical indicators that change color in the presence of hydrogen. -While current technologies can detect leaks from point sources (e.g. due to fittings or failure of seals), most cannot also autonomously communicate, in rapid dynamic response times, with a facility to notify its operator of the leak. -Additionally, their performance is challenged in outdoor environments, where heightened sensitivity is required due to the potential for hydrogen to diffuse widely.

This subtopic seeks R&D on enabling viable leak detection technologies including integration with communications technologies that notify a system operator when a leak occurs. -Phase I funding is for proof-of-concept R&D and testing of communications concepts (e.g. radio frequency identification distributed networks) that may be integrated with existing leak detectors. -Phase II funding would enhance the sensitivity of the leak detection technologies to improve their performance in outdoor environments while meeting affordability targets. -Concepts proposed should be resilient when exposed to high concentrations of hydrogen, compatible with a large assortment of operating systems, ~~and capable~~and capable of communication with a facility within sub seconds.

Questions – Contact: Laura Hill, Laura.hill@ee.doe.gov

d. Smart Sensors for Structural Health Monitoring (SHM) of Composite Overwrapped Pressure Vessels (COPVs) of On-board Hydrogen Storage for Fuel Cell Electric Vehicles (FCEVs)

Fuel Cell Electric Vehicles (FCEVs) are now commercially available in certain parts of the U.S. and around the world with many meeting the initial DOE goal of a 300 mile driving range using carbon fiber composite overwrapped pressure vessels (COPV) rated for 700 bar compressed hydrogen service. [1] In addition, there are now approximately 35 retail hydrogen refueling stations open to the public in California with several more expected to come online soon.~~(~~. [2]

To harness American energy resources safely and efficiently and to improve the safety of the high-pressure COPVs, there is interest in developing health monitoring sensors that can provide real-time indication of potential damage or degradation of the composite overwraps. Real-time sensors could also eventually lead to reduction in the manufacturing overdesign of the COPVs and thus lower overall cost. Damage to the composite overwraps can result from pressure loads over time, environmental induced degradation in operation, and accidental mechanical impacts. COPVs can be subjected to a broad range of damage mechanisms, either usual (e.g., cycling) or accidental (e.g., car accident, fall or impact during transport, handling, installation, etc.). Potential damage mechanisms can include fiber breakage, delamination and matrix cracking. R&D is needed to improve characterization of COPV damage resulting from a mechanical

impact (e.g. from a projectile or drop), its evolution under typical in-service loadings (monotonic pressurization, filling/emptying cycles, etc.), and the corresponding loss of performance. This is partially due to there being only a few studies addressing the consequence of impact on the residual lifetime of composite materials obtained by filament winding. In addition a surface impact could create damage in the thickness of the composite and can even damage the liner. [3] Such sensors could also be utilized for COPVs used in other applications, such as onboard compressed natural gas (CNG) vehicles and self-contained breathing apparatuses (SCBA) used by first responders.

To ensure of the structural health of the COPVs to prevent unexpected failure, online monitoring of the tank would be of value. Applications are sought to perform early stage research, development and demonstration (RD&D) of techniques/instruments/technologies that can monitor vital aspect of COPVs. The monitoring needs to be imbedded/integrated into the COPV and can monitor COPV features passive or actively.

Some potential areas of interests include, but are not limited to:

- Non-Destructive Evaluation (NDE) techniques for continuously monitoring structural health for improved fatigue life, stress rupture, and damage tolerance.
- Gauges for sensing and recording/reporting abnormalities in stress, strain, localized pressure and temperature rise, cycle counting, and scheduled maintenance.
- Sensors for detecting permeation, leakage, pressure decay, humidity, and localized heat transfer.
- Massive data collection effort through network connected SHM sensors to drive reduction in statutory overdesign (e.g. reduce safety factor and/or necessary manufacturing overdesign).

Questions – Contact: Bahman Habibzadeh, bahman.habibzadeh@ee.doe.gov

e. Innovative Concepts for Hydrogen Conversion to Liquid Hydrocarbon Fuels

Applications are sought for innovative catalyst and reactor designs for synthesis of liquid hydrocarbons from captured CO2 and hydrogen produced from renewable energy sources.

One promising pathway for utilization of stranded renewable energy resources is synthesis of renewable liquid hydrocarbon fuels from captured CO2 and H2 produced through water splitting utilizing renewable energy. These liquid hydrocarbons are compatible with the existing fuel infrastructure and can provide means for inexpensive transportation, storage, and distribution of renewable energy, ultimately creating a sustainable carbon cycle for energy production and utilization.

Several commercial processes can produce liquid hydrocarbons from coal or natural gas, (e.g. Fischer-Tropsch, Methanol, DME synthesis) by first converting the fuel into syngas (a mixture of CO and H2) followed by liquid hydrocarbon synthesis step. Presently, these processes are generally carried out in large scale reactors under continuous operating conditions. Several important modifications to the existing processes will need to be implemented in order to make them compatible with liquid hydrocarbon production from captured CO2 and renewable H2 and adapted to utilizing renewable energy sources.

Firstly, the processes and catalysts have to be modified to operate with CO2 instead of CO in the feed. Conversion of CO2 into CO in a reverse Water-Gas-Shift (RWGS) process is one option. Direct synthesis from CO2 and H2 is another, more direct approach. Secondly, the hydrocarbon synthesis processes have to be adapted to operation with inherently intermittent and distributed renewable energy sources, such as wind or

solar. This will require operating smaller production units that are capable of frequent start/stop and production ramping up and down [1,~~2,3~~, 2, 3].

Questions – Contact: Eric Miller, eric.miller@ee.doe.gov

General References:

[1] Fuel Cell Technologies Office (FCTO) http://energy.gov/eere/fuelcells/fuel-cell-technologies-office
[2] Nguyen, T. and Ward, J., 2016, Life-Cycle Greenhouse Gas Emissions and Petroleum Use for Current Cars, U.S. Department of Energy, Fuel Cell Technologies Office, p. 5.
https://www.hydrogen.energy.gov/pdfs/16004_life-cycle_ghg_oil_use_cars.pdf
[3] Andress, D., Nguyen, T., and Morrison, G., 2016, GHG Emissions and Petroleum Use Reduction from Fuel Cell Deployments, U.S. Department of Energy, Fuel Cell Technologies Office, p. 8.
https://www.hydrogen.energy.gov/pdfs/16003_ghg_emissions_oil_use_reduction_from_fc.pdf

Subtopic a) References:

[1] Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan (Section 3.4 Fuel Cells): https://www.energy.gov/eere/fuelcells/downloads/fuel-cell-technologies-office-multi-year-research-development-and-22 Pages 3.4-20, 48, 49, and 50

Subtopic b) References:

[1] Sprick, S. et al (2018). "Next Generation Hydrogen Station Composite Data Products: All Stations (Retail and Non-Retail Combined)—Data through Quarter 4 of 2017." https://www.nrel.gov/docs/fy18osti/71644.pdf.
[2] https://www.sae.org/standards/content/j2601_201612/.

Subtopic d) References:

[1] http://www.fueleconomy.gov/feg/fcv_sbs.shtml
[2] http://cafcp.org/stationmap
[3] https://www.hysafe.info/wp-content/uploads/2017_papers/293.pdf

5. GEOTHERMAL

Maximum Phase I Award Amount: (b)(5)	200,000	Maximum Phase II Award Amount: (b)(5)	1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

Geothermal energy is secure, reliable, flexible, and constant. It continues to be one of America's best choices for low-cost renewable energy in power generation and in direct-use applications for heating and cooling of American homes and businesses. The Geothermal Technologies Office (GTO) focuses on applied research, development, and innovations that will improve the competitiveness of geothermal energy and support the continued expansion of the geothermal industry across the U.S. [1]. Currently, the U.S. has 3.8 gigawatts electric (GWe) of installed geothermal capacity, while advances in technologies such as Enhanced Geothermal Systems (EGS) could enable access and deployment of more than 100 GWe of new geothermal capacity. Consistent with the administration's R&D priority in American Energy Dominance, this topic seeks to invest in early-stage, innovative technologies that show promise in harnessing new domestic geothermal resources that provide clean, affordable, and reliable energy. Because deploying additional baseload geothermal energy will

contribute to grid reliability and resilience as well as national security, this topic supports the Acting Assistant Secretary for EERE's grid integration priority.

A Phase I application should focus on proof of concept and bench scale testing that are scalable to a subsequent Phase II prototype development. Applications must be responsive to the following subtopice.; Aany application outside of this area will not be considered.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopic:

a. Improved downhole telemetry for geothermal drilling

In this topic, GTO solicits innovative research and development projects to enable improved downhole telemetry for geothermal drilling operations. Drilling operations can be up to 50% of the cost of the development for a geothermal project [2]. Improving downhole telemetry during drilling can reducing drilling costs and risks that would help spur the geothermal industry to expand capacity in the near-term. The International Association of Drilling Contractors defines downhole telemetry as "Signals transmitted in real-time (while drilling) from an instrument located near the bottom of the drill string to a receiving monitor on the surface (a surface-readout)" [3]. Enabling real-time data transfer from tools and sensors in the bottom-hole assembly (BHA) to the drill operator can lead to improved rates of penetration (ROP), reduced non-drilling time (NDT), and increased safety through real-time wellbore stability monitoring. Additionally, a better understanding of well depth and location and increased control for directional drilling could lead to reduced operational and stimulation costs. Current practices for downhole telemetry include wireline embedded within the drill-pipe, electromagnetic (EM) signals passed through the formation, acoustic signals carried over the drill-pipe, and sonic signals carried the drilling fluid or "mud pulse." Of these options, wireline telemetry is often not feasible and mud pulse, acoustic, and EM have limitations on bit transmission rates and data quality [4]. Additionally, geothermal wells can be drilled without a drilling fluid (called "air drilling"), which eliminates the option of mud pulse telemetry. This topic is seeking innovations that go beyond these current practices seeking to improving bit transmission rate, reducing signal attenuation, and/or reducing costs by at least 25% over current state-of-the-art. Responses to this topic must address downhole telemetry issues specific to geothermal drilling, which can include, but are not limited to: higher temperatures (>250°C), drilling through crystalline formations with little to no porosity, and air drilling.

While the high temperatures in geothermal wells often cause issues with standard electronics associated with downhole telemetry, this topic is not seeking innovations solely into new high-temperature electronics. Novel wide-bandgap semiconductors may only be proposed as a component to an otherwise innovative downhole telemetry system, not as the proposed innovation.

This topic is solely focused on downhole telemetry during geothermal drilling operations; innovation into other types of telemetry (such as long term well monitoring, fiber optic cables embedded in wellbores, etc.) will be deemed not responsive.

Questions – contact joshua.mengers@ee.doe.gov

References:

[1] Geothermal Technologies Office Website: https://energy.gov/eere/geothermal
[2] Tester et al., 2006, "The Future of Geothermal Energy, Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century"
https://www1.eere.energy.gov/geothermal/pdfs/future_geo_energy.pdf
[3] http://drillingmatters.iadc.org/glossary/downhole-telemetry/
[4] Almeida Jr. et al., 2015 "a Review of Telemetry Data Transmission in Unconventional Petroleum Environments Focused on Information Density and Reliability"
https://file.scirp.org/pdf/JSEA_2015090414401392.pdf

6. SOLAR

Maximum Phase I Award Amount: (b)(5)	$200,000	**Maximum Phase II Award Amount:** (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		**Accepting STTR Phase I Applications:** YES	

The Solar Energy Technologies Office (SETO)[] [1] is the primary office within the U.S. Department of Energy (DOE) that funds innovations in solar power. The office is housed within the Office of Energy Efficiency and Renewable Energy (EERE). SETO supports early-stage research and development to improve the affordability, reliability, and performance of solar technologies on the grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use and storage of solar energy, and lower solar electricity costs.

In September 2017 the office announced that its goal to make solar electricity costs competitive with other generation sources by 2020, without subsidies, had been met three years ahead of schedule for utility-scale photovoltaic solar systems [2]. The office will continue to work to lower the cost of solar (photovoltaics and concentrated solar power) energy and has established a goal to halve the cost of solar energy by 2030 [3]. With the dramatic reduction in the cost of solar, installations have soared, creating new challenges and opportunities for the electricity grid. To account for these changing needs, the office is also focusing on solar energy research and development efforts that help address the nation's critical energy challenges: grid reliability, resilience, and affordability.

Within this Funding Opportunity Announcement, SETO is releasing this Topic and joining the EERE Advanced Manufacturing Office in releasing Joint Topic 10 on "Innovation in solar module manufacturing processes and technologies."

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical and business milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are referenced to a benchmark;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

In this Topic, SETO seeks applications for the development of innovative and impactful technologies in the subtopics of:

a. TECHNOLOGY TRANSFER OPPORTUNITY: Real-Time Series Resistance Monitoring in Photovoltaic Systems

Sun Open Circuit Voltage (Suns-Voc) analysis provides a method to probe the hypothetical, series-resistance free, current-voltage (I-V) curve of a photovoltaic device.- While historically Suns-Voc has been used for the analysis of photovoltaic cells under controlled laboratory conditions, recent work at NREL has extended the Suns-Voc methodology to develop automated Real-Time Series Resistance ("RTSR") monitoring capabilities for photovoltaic modules in the field. NREL's RTSR methodology is useful to passively detect common failure modes found in installed modules, including broken ribbons, failed solder bonds, or improperly joined junction/combiner box connections in modules and systems all under normal outdoor operation, by analysis of current and voltage information taken from the inverter. –Early detection of these failure modes is critical for solar O&M providers in order to reduce potential fire risk, as well as to identify degraded, improperly installed, or otherwise underperforming modules in need of replacement. -NREL is currently looking for partners to develop hardware and software related to the improved Suns-Voc techniques for commercial applications.

National Renewable Energy Laboratory Information:
Licensing Information: National Renewable Energy Laboratory
Contact: Bill Hadley; bill.hadley@nrel.gov; (303) 275 3015
License type: Non-Exclusive
Patent Status: U.S. Patent Application Serial No. 15/564,357
Publication date:
Filing date:
http://appft1.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PG01&p=1&u=/netahtml/PTO/srchnum.html&r=1&f=G&l=50&s1=20180131322.PGNR.

Questions – contact solar.sbir@ee.doe.gov

b. TECHNOLOGY TRANSFER OPPORTUNITY: PV module Soiling Spectral Deposition Detector

Accumulation of dust, particles, and dirt on the surface of photovoltaic modules can cause a reduction in the intensity of light transmitted through the module cover and therefore in the amount of energy generated. Recent studies have shown that total power losses in Europe and the U.S. approach 7% annually due to soiling and are much worse (up to 70%) in other parts of the world. -This has significant impact on the solar market; a

flat 4% soiling loss affecting all PV capacity worldwide has been estimated to result in potentially over $1 Billion in lost revenue annually. While PV modules can be cleaned, the one-time cost for doing so is quite expensive: between $0.20-0.50 per module (or $5,000 for a 10 MW system). Thus, it is important to monitor soiling in order to plan for the most accurate cleaning schedule of a system; while uncleaned modules result in unnecessary revenue loss due to diminished energy generation, the cost of cleaning modules can be prohibitively expensive if ineffectively performed. There exists a need to determine the exact level of soiling present in an installed PV system so as to make educated decisions about when cleaning of the system is required. NREL has developed a prototype device which can detect the amount of soiling present throughout an installed PV system and correlate that soiling level with lost power generation. In this way, informed decisions about how and when to clean installed modules can be made. NREL is currently looking for a partner to perform continued field-tests and optimization of the device in various real-world scenarios, environments, and weather conditions.

National Renewable Energy Laboratory Information:
Licensing Information: National Renewable Energy Laboratory
Contact: Bill Hadley; bill.hadley@nrel.gov; (303) 275 3015
License type: Non-Exclusive
Patent Status: U.S. Patent Application Serial Nos. 62/652,955 & 62/690,086
Publication date:
Filing date:

Questions – contact solar.sbir@ee.doe.gov

c. Storage technologies to enable low-cost dispatchable solar photovoltaic generation

One of the priorities of the SETO office is to support early-stage, innovative solar technologies that show promise in harnessing American energy resources safely and efficiently. In this topic, we are interested in exploring approaches that can provide opportunities for energy storage that is well suited to integration with solar photovoltaic technology, or optimizing energy use. SETO plans include collaboration with the U.S. Department of Energy's Office of Electricity [1] to select and manage awards under this subtopic.

As solar electricity costs continue to decrease, the percentage of solar photovoltaic generation (both from distributed and utility-scale systems) in the U.S. increases. This opens up new challenges and opportunities for the development of novel technologies that can enable low-cost dispatchable solar PV generation that enables increased integration and operation flexibility and allow solar electricity to be better matched to demand.

In this subtopic, SETO is seeking innovative storage technologies that could be co-located with solar photovoltaic systems and are fully compatible with the characteristics of the typical output of a solar inverter (medium-low voltage, variable generation). Technologies proposed should leverage attributes specific to solar photovoltaic generation technologies while addressing current integration gaps and challenges. SETO is especially interested in novel thermal, mechanical or chemical storage technologies that can demonstrate clear non-incremental differentiation from the current state of the art.

Applications must include a basic cost-model analysis showing a path to be cost-competitive with current state of the art, and with the potential to increase the utilization of solar photovoltaic generation in the grid.

Storage functionalities at any time scale will be considered (minutes, hours, days, seasonal). ~~However, t~~The application should clearly discuss which energy value stream this technology will target, if successful.

Applications will be considered ~~non-responsive~~non-responsive and declined without external merit review if they describe a software-only solution or a solution based on existing battery technologies or if the technology is aimed at self-consumption optimization or the application does not demonstrate a clear innovation compared to current the state of the art.

Questions – contact solar.sbir@ee.doe.gov

d. Hardened solar system design and operation for recovery from extreme events

One of the priorities of the SETO office is to enhance the ability of solar energy technologies to contribute to grid reliability and resilience as well as national security, including but not limited to security and resilience of the Nation and its critical infrastructure.

Infrastructure systems, including the electrical grid and solar generation assets (both photovoltaic and concentrating solar power) are vulnerable to extreme weather and other disruptive events. Increased asset resilience presents opportunities to maximize operability, energy availability (along with communications, water, etc.~~r,~~), and to minimize restoration costs following these occurrences.

In this subtopic, SETO is seeking innovative proposals to improve the ability of solar assets and systems to quickly recover in response to extreme events. Proposals may address specific component or system designs that passively (such as more structurally robust designs or configurations) or actively (such as array/tracker stow strategies or "hardened" components) improve survival and/or recovery time and minimize cost associated with extreme events.

Applications must include a basic cost-model analysis showing the cost/benefit of the proposed solution in comparison to current state of the art. Applications should also identify a possible case use by defining the time to recover the system fully functionalities, and provide substantiated estimates for the capabilities of the proposed approach.

Targets and metrics for hardened solar system performance could include (but are not limited to):

- Percent of system operable after extreme event (applications should specify type and intensity);
- ~~-~~Survivability at extreme wind loads (> 125 mph) is of particular interest;
- Time to full system operability after extreme event (restoration time);
- Reduction in system restoration cost following extreme event;
- Level of functionality without grid support following extreme event (islanding).

Applications will be considered ~~non-responsive~~non-responsive and declined without external merit review ~~if~~ the application does not demonstrate clear innovation compared to current the state of the art, particularly in regard to microgrid and/or islanding behaviors.

Questions – contact solar.sbir@ee.doe.gov

e. Rural solar

One of the goals of the SBIR/STTR programs is to encourage the participation of socially and economically disadvantaged persons in technology innovation with increasing geographic diversity of grant funding.

Small and medium-scale (non-utility) solar systems are mostly deployed in urban residential or commercial and industrial settings (we will refer to them as traditional locations within this subtopic). In this subtopic, SETO is seeking the development of solar photovoltaic products or system designs to enable and increase use of non-traditional installation locations when deploying small and medium-scale solar photovoltaic technologies. Such technological solutions could enable rural or economically challenged home or business owners, as well as small land holders to participate in the American solar economy and receive the associated ~~benefits~~[benefits [1]. Proposed solutions should provide particular attention to safety. In addition, solutions should be designed for flexible deployment on a variety of terrains or building types. SETO is particularly interested in technology innovation that would enable installation of solar systems on agricultural or multiuse land, including solutions that allow for complementary land use~~-/~~/-value streams in a synergistic manner.

Applications should always identify possible use~~-~~-case(s) and provide substantiated estimates for the capabilities of their proposed system or technology. In addition, the Applications should demonstrate that the proposed technology is cost competitive (compared to other sources of electricity) in these non-traditional locations. In their commercialization plans, Applicants should include their strategy to enter new and potentially difficult markets outside of the areas that have seen significant solar deployments over the past 10 years.

Applications will be considered ~~non-responsive~~non-responsive and declined without external merit review if within one of these areas:

- ~~Undifferentiated products, incremental advances or duplicative products;~~
  13.
- ~~Applications focusing exclusively on HVAC or water heating applications;~~
  14.
- ~~Products or solutions for systems which do not tie to the electric grid (i.e. wholly off-grid applications, portable power, solar fuel);~~
  15.
- Software-only solutions.

Questions – contact solar.sbir@ee.doe.gov

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f. Affordability, reliability, and performance of solar technologies on the grid

Fueling America's energy portfolio requires access to domestic sources of clean, affordable, and reliable energy. Unleashing these abundant energy resources will require investment in next-generation energy technologies to efficiently convert them into useful energy services.

In 2017, solar power generated almost 1.5% of the total annual electricity supply in the United States, and the Energy Information Administration projects that solar will grow to 5% of U~~.~~S~~.~~ electricity by 2030 [1]. ~~-~~Further, if the price of solar electricity and/or energy storage declines more rapidly than projected, that percentage could be even higher. ~~-~~But solar is more than just a source of affordable electricity; it also provides the

potential to improve grid reliability and resilience, increase employment, create business opportunities, increase energy diversity, expand domestic manufacturing, and provide environmental benefits.

In this subtopic, SETO is seeking integrated solutions that can advance solar energy technologies by lowering ~~cost~~[cost [2] while facilitating the secure integration into the nation's energy grid. Applications should fall within one of these areas:

- Advanced Solar Systems Integration Technologies: responsive applications would advance the prediction, monitoring, and control of solar power production and distribution and the capabilities of solar power electronics;
- Concentrating Solar Thermal Power technologies: responsive applications would develop technologies that focus sunlight to generate and store high-temperature heat for electricity generation and other end uses;
- Photovoltaic technologies: responsive applications would improve photovoltaic system reliability, annual energy yield, reduce supply-chain capital expense, demonstrate performance of novel photovoltaic materials and components, and develop new photovoltaic materials.

SETO is particularly interested in applications developing:

- Technologies which can reduce the manufacturing costs of solar energy system components or sub-components to boost domestic energy manufacturing and increase U.S. manufacturing competiveness;
- Technologies which enhance the ability of solar energy systems to contribute to grid reliability, resiliency and security;
- Development and publication of replicable system designs for configurations that could be installed across comparable sites (e.g. homes or commercial buildings with similar roofing)
- Designs for photovoltaic modules and system configurations that anticipate updates in codes or safety requirements;
- Technologies to improve recyclability of photovoltaic materials and components;
- Technologies / solutions that reduce the balance of system component of the cost of a photovoltaic system.

Applications must include a clear assessment of the state of the art and how the proposed technology would represent a significant improvement, along with a basic cost-model analysis showing a path to becoming cost-competitive with current state of the art and the potential to increase the utilization of solar generation in the grid.

Applications will be considered ~~non-responsive~~non-responsive and declined without external merit review if within one of these areas:

- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics);
- Applications that fall in any of the other subtopics listed in this funding opportunity announcement;
- Business plans or proofs-of-concept that do not include documentation supporting the necessity or benefit of the plan or concept. Competitive approaches in this application segment should be clearly defined in the application;
- Undifferentiated products, incremental advances or duplicative products;
- Projects lacking substantial impact from federal funds. This subtopic intends to fund projects where federal funds will provide a clear and measurable impact, (e.g. retiring risk sufficiently for follow-on

investment or catalyzing development.) Projects that have sufficient monies and resources to be executed regardless of federal funds are not of interest;

- Applications focusing exclusively on HVAC or water heating applications;
- Products or solutions for systems which do not tie to the electric grid (i.e. wholly off-grid applications, portable power, solar fuel);
- Software to facilitate system design or system monitoring;
- Any software solution to improve customer acquisition processes.

This subtopic seeks to assist independent small businesses which can fully support themselves, continue to grow, and successfully bring a new technology into the market. This opportunity is not intended for creating a product, organization, service, or other entity or item which requires continued government support. This subtopic does not intend to fund work that has already received federal support for similar technology at the same technology readiness level.

Questions – contact solar.sbir@ee.doe.gov

References:

[1] https://energy.gov/solar-office
[2] https://www.energy.gov/articles/energy-department-announces-achievement-sunshot-goal-new-focus-solar-energy-office
[3] https://www.energy.gov/eere/solar/goals-solar-energy-technologies-office

Subtopic c) References:

[1] https://www.energy.gov/oe/office-electricity

Subtopic e) References:

[1] https://www.cooperative.com/content/public/maps/esri-solar-story-map/index.html

Subtopic f) References:

[1] U.S. Department of Energy, Energy Information Administration, International Energy Outlook 2017, DOE/EIA-0484 (2017)
[2] https://www.nrel.gov/docs/fy17osti/68105.pdf

7. VEHICLES

Maximum Phase I Award Amount: (b)(5)	200,000	**Maximum Phase II Award Amount:** (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		**Accepting STTR Phase I Applications:** YES	

Last year, vehicles transported 11 billion tons of freight, more than $32 billion worth of goods each day, and moved people more than 3 trillion vehicle-miles. The U.S. Department of Energy's Vehicle Technologies Office

(VTO) provides low cost, secure, and clean energy technologies to move people and goods across America. VTO (https://www.energy.gov/eere/vehicles/vehicle-technologies-office) [1] focuses on reducing the cost and improving the performance of vehicle technologies (b) (5) -including advanced batteries, electric traction drive systems, lightweight materials, advanced combustion engines, and advanced fuels and lubricants. VTO supports the development and deployment of advanced vehicle technologies, including advances in electric vehicles, engine efficiency, and lightweight materials. Since 2008, the Department of Energy has helped reduced the costs of producing electric vehicle batteries by more than 75%. DOE has also pioneered improved combustion engines that have saved billions of gallons of petroleum fuel, while making diesel vehicles as clean as gasoline-fueled vehicles.

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. Multi-Year Program Plan (MYPP) or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data
- Applications that duplicate research already in progress will not be funded; all submissions therefore should clearly explain how the proposed work differs from other work in the field.

Grant applications are sought in the following subtopics:

a. Electric Drive Vehicle Batteries

Applications are sought to develop electrochemical energy storage technologies that support commercialization of micro, mild, and full HEVs, PHEVs, and EVs. Some specific improvements of interest include the following: new low-cost materials; alternatives or recycling technologies of energy storage critical materials defined at: https://www.energy.gov/policy/initiatives/department-energy-s-critical-materials-strategy [1]; high voltage and high temperature non-carbonate electrolytes; improvements in manufacturing processes – specifically the production of mixed metal oxide cathode materials through the elimination or optimization of the calcination step to reduce cost and improve throughput, speed, or yield; novel SEI stabilization techniques for silicon anodes; improved cell/pack design minimizing inactive material; significant improvement in specific energy (Wh/kg) or energy density (Wh/L); and improved safety. Applications must clearly demonstrate how they advance the current state of the art and meet the relevant performance metrics listed at www.uscar.org/guest/article_view.php?articles_id=85 [2].

When appropriate, the technology should be evaluated in accordance with applicable test procedures or recommended practices as published by the Department of Energy (DOE) and the U.S Advanced Battery Consortium (USABC). These test procedures can be found at www.uscar.org/guest/article_view.php?articles_id=86 [3]. Phase I feasibility studies must be evaluated in full cells (not half-cells) greater than 200mAh in size while Phase II technologies should be demonstrated in full cells greater than 2Ah. Applications will be deemed non-responsive if the proposed technology is high cost; requires substantial infrastructure investments or industry standardization to be commercially viable; and/or cannot accept high power recharge pulses from regenerative breaking or has other characteristics that

prohibit market penetration.- Applications deemed to be duplicative of research that is already in progress or similar to applications already reviewed this year will not be funded; therefore, all submissions should clearly explain how the proposed work differs from other work in the field.

Questions -- contact Samm Gillard, Samuel.Gillard@ee.doe.gov

b. SiC devices suitable for Electric Vehicle Extreme Fast Chargers

The push to reduce charging time through Extreme Fast Charging (XFCs) ~~needed~~ for Battery Electric Vehicles (BEVs) creates a suite of intertwined R&D challenges. In addition to the R&D challenges for vehicles and battery technologies, there is a distinct need to understand how fast charging up to 400 kW will impact Electric Vehicle Service Equipment (EVSE) and XFC-related infrastructure costs. Design of these charging stations needs to include (b) (5) -power electronics that can withstand elevated current and voltage levels for vehicle charging. Performance requirements and gaps for XFCs can be found at: https://www.energy.gov/sites/prod/files/2017/10/f38/XFC%20Technology%20Gap%20Assessment%20Report_FINAL_10202017.pdf [1].

~~Given~~ Tthe planned voltage and current levels for XFC, ~~these systems~~ require ~~necessitate~~ high power semiconductors to achieve high power levels and short recharge times. A medium voltage grid input can reduce installation costs and increase efficiency for vehicle charging, ~~u~~Using solid state approaches to grid isolation and power conditioning, and ~~which~~ can contribute to grid reliability and resilience as well as national security.- In particular, high voltage Silicon Carbide (SiC) devices (b) (5) with their inherently high breakdown voltage and low loss characteristics are suited to fast charging applications. This subtopic seeks proposals to develop devices with higher current and voltage ratings that will enable improvements in vehicle extreme fast chargers.

This subtopic seeks proposals ~~to~~ that ~~address this~~overcome the limitations of currently available technologies by ~~barrier through~~ demonstrating the successful production of > 150A, > 1200V rated SiC devices that are suitable for extended use in high power EVSEs. Specifically, prototypes ~~devices~~ produced in Phase II should ~~show application readiness through~~ passing full or partial qualification specifications or standards at high device production yields. In Phase I, ~~D~~device production quantities are not expected to be sufficient to pass full qualification ~~for Phase 1 projects,~~. ~~Where possible,~~ In Phase I, applicants should show a relationship to, and demonstrate an understanding of, electric vehicle charging application requirements and environments. Examples include fast charging requirements for surface and/or substrate treatments and processing, ~~;~~ compatibility with existing power module, or power stage packaging and processing. ~~;~~Other requirements are related to ~~and~~ design for long-term reliability ~~such~~ even with ~~as~~ device degradation. ~~Projects~~ Proposals should show a path towards full qualification of XFS technologies with commercial-ready devices integrated into a functional module by the end of Phase II.

Questions – contact: Steven Boyd, steven.boyd@ee.doe.gov

c. Reduction of Thermal and Friction Losses in Internal Combustion Engines

Applications are sought to develop technologies that can provide significant fuel efficiency gains to reciprocating internal combustion engines without appreciable increases in cost or complexity. Potentially effective approaches for increasing efficiency include improved thermal management strategies, such as use of thermal barrier coatings or efficient, low-cost waste heat recovery strategies, and friction reduction strategies, such as use of low friction coatings or surfaces. Refer to the Advanced Combustion and Emission Control Roadmap here: https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf [1].

Applications must demonstrate that the target technologies:

- Are viable in current reciprocating engine architectures;
- Are compatible with widely available fuels and lubricants;
- Have a low expected additional cost to implement on an automotive or heavy-duty engine;
- Work reliably for the typical lifetime of the vehicle;
- Are likely to be successfully implemented on a modern, production automotive engine in Phase II.

Reporting must include fuel consumption test results compared with a second, unmodified, otherwise identical engine. All fuel consumption testing must be conducted according to engine industry norms. Statistically valid fuel economy improvements (95% confidence level) of at least 2.0% are desired.

Questions – contact: Mike Weismiller, Michael.Weismiller@ee.doe.gov

d. Co-Optimization of Fuels and Engines

On-road transportation is likely to remain reliant on liquid fuels for decades, due to the superior energy density and fast refueling times that liquids afford. As a result, although electrification has promise to displace internal combustion engines in some applications, advances in combustion will still have substantial impact on transportation-based energy consumption and emissions [1]. While benefits can be obtained by improving fuel resources or engine designs independently, an even larger impact can be had by optimizing new fuels and engines in conjunction with each other. For example, rather than finding new fuels that can be integrated into existing engines such as higher ethanol blends in stock gasoline engines, and biodiesel into typical Diesel engines or making incremental refinement of existing engines using traditional fuels, there is even greater opportunity in developing new engines to harness the unique properties of alternative fuels. As a result, grant applications are sought to develop engine designs that are co-optimized for operation on a non-traditional liquid fuel, including:

- Light-duty engine designs that utilize a multi-mode combination of spark-ignition and compression-ignition of biomass-based liquid fuel blends to optimize engine operation across the entire load map. These engines should be able to demonstrate at least a 10% improvement in fuel economy over baseline spark-ignition-gasoline operation (i.e., comparable engine on AKI 87 gasoline).
- Medium- and heavy-duty engine designs that use non-diesel/biodiesel liquid fuels in compression-ignition architectures. At minimum, such approaches should be able to achieve traditional Diesel torque and efficiency, but with a significant reduction in criteria pollutants and carbon impact.
- Non-traditional engine designs (such as opposed piston engines, or similar architecture deviations) that operate on a suitably co-optimized liquid alternative fuel. The benefits for such technologies must be proportional to the level of deviation required from traditional engine production processes.

Applications that heavily rely on fuels/additives that are not currently produced at significant scale should include techno-economic analysis to justify commercial potential.

Questions – contact: Kevin Stork, kevin.stork@ee.doe.gov

e. Improving the Performance and Reducing the Weight of Cast Components for Vehicle Applications

The Vehicle Technologies Office Materials Technology Program targets 25% glider weight reduction at less than $5/~~lb~~lb. saved by 2030. Materials play a major role in the U.S. DRIVE Partnership by enabling lightweighting of structures and systems to improve fuel economy and by reducing demands on the vehicle powertrain and ancillary systems [1]. To accomplish these goals it is necessary to reduce the weight of all components within the vehicle. Cast metal components, made from cast iron, aluminum alloys, and magnesium alloys represent a significant percentage of the total vehicle weight and will need to be addressed to meet the stated goals. Although weight reductions can be achieved through materials substitution, the performance of cast metal components is often dominated by the imperfections in the casting that result from the casting process.

Applications are sought to develop and improve casting processes that result in a significant reduction in casting imperfection leading to increases in component strength, fatigue life, and allowing redesigns that lead to significant (>20%) reductions in component weight.

Applications should provide baseline data on target casting process, component, component performance, and baseline material composition(s) and properties. Proposals should include a clear description of the imperfections to be addressed and the methodology to be employed to make the proposed improvements.

Applications should show a pathway to commercial high volume production rates necessary for the automotive industry and demonstrate that there is a high likelihood that the cost effectiveness targets of $5/~~lb~~lb. saved can be achieved by 2030.

This topic does not include a new materials development program and applications containing a new materials development program will be considered out of scope.

Questions – contact Jerry Gibbs, jerry.gibbs@ee.doe.gov or Sarah Kleinbaum, sarah.kleinbaum@ee.doe.gov

f. Low Cost, Lightweight, and High-Performance Fiber-Reinforced Composites for Vehicle Applications

The Vehicle Technologies Office's Materials Technology Program targets 25% glider weight reduction at less than $5/~~lb~~lb. saved by 2030. Materials play a major role in ~~the~~ DOE's U.S. DRIVE Partnership by enabling vehicle lightweighting of structures and systems to improve fuel economy and reduce demands on the vehicle powertrain and ancillary systems. The Materials Technical Team in the U.S. DRIVE updated its roadmap in October 2017[1]. Within this roadmap, the area of carbon fiber composites~~,~~ is one of the four material systems of the most interest to the automotive industry. ~~is most interested in.~~ While the c~~C~~urrent materials focus of the DRIVE partnership is solely for primary structure applications~~; however~~, there are many secondary structures of vehicle components in the automotive industry, which are also critical and ~~important and~~ in ~~with~~ high demand ~~to the automotive industry~~.

Applications are sought to develop and test new innovative materials ideas including carbon fiber and ~~beyond the~~ carbon fiber ~~and their~~ composites. In addition to research on low cost carbon fiber, ~~research,~~ applications can include development of alternative fibers (e.g., natural fiber/bio-degradable fiber) and resins (e.g., polymers, bio-degradable polymer, fast curing resin), and their processes or any forms of the fiber-reinforced materials such as (continuous, discontinuous, particulate fibers, or hybrid that can make ~~benefit~~ vehicle's lightweight and high performance with affordable cost. Applications can also include development of innovative and cost-effective manufacturing processes, such as low-cost, high-speed manufacturing with net shape. In particular, applications are sought to ~~,~~ reduce~~ing~~ manufacturing cycle time to less than 3 minutes (ideally for 90 seconds), and develop~~ment~~ ~~of~~ composite intermediates (e.g., prepregs, injection molding compound, SMC, BMC, long-fiber thermoplastics, non-crimp fabrics, and nonwovens). For such applications the ~~in which the~~ expected outcomes ~~can significantly help and~~ should support the automotive industry in utilizing fiber-reinforced composites in high-volume production.

The process from manufacturing carbon fiber to production of finished components is wasteful; it is estimated that more than 30% of produced carbon fiber ends up as waste at some point in the process. ~~One area t~~The carbon fiber composites industry differs from other automotive materials supply industries in its ~~is the high proportions of waste during fiber production and the~~ lack of an effective recycling solution and recyclability. Applications are also sought to develop viable recyclability technologies that can help ~~save~~ reduce carbon fiber or non-carbon fiber composites waste. Applications also are sought for technologies that promote ~~and for future~~ lightweight vehicle reusability.

Questions – contact Felix Wu, felix.wu@ee.doe.gov or Will James, charles.james@ee.doe.gov

References:

[1] Vehicle Technologies Office (FCTO) https://www.energy.gov/eere/vehicles/vehicle-technologies-office

Subtopic a) References:

[1] Critical Materials Strategy:
https://www.energy.gov/policy/initiatives/department-energy-s-critical-materials-strategy
[2] USABC Energy Storage System Goals http://www.uscar.org/guest/article_view.php?articles_id=85
[3] USABC Manuals: www.uscar.org/guest/article_view.php?articles_id=86

Subtopic b) References:

[1] Enabling Fast Charging: A Technology Gap Assessment:
https://www.energy.gov/sites/prod/files/2017/10/f38/XFC%20Technology%20Gap%20Assessment%20Report_FINAL_10202017.pdf

Subtopic c) References:

[1] Advanced Combustion and Emission Control Roadmap:
https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf

Subtopic d) References:

[1] Advanced Combustion and Emission Control Roadmap:
https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf

Subtopic e) References:
[1] Materials Technical Team Roadmap:
https://www.energy.gov/eere/vehicles/downloads/us-drive-materials-technical-team-roadmap

Subtopic f) References:
[1] Materials Technical Team Roadmap:
https://www.energy.gov/eere/vehicles/downloads/us-drive-materials-technical-team-roadmap

8. WATER

Maximum Phase I Award Amount: (b)(5)	$200,000	*Maximum Phase II Award Amount:* (b)(5)	$1,100,000
Accepting SBIR Applications: **YES**		*Accepting STTR Applications:* **YES**	

The Office of Energy Efficiency and Renewable Energy's Water Power Technologies Office (WPTO) (http://energy.gov/eere/water/water-power-program) conducts early-stage research and development to strengthen the body of scientific and engineering knowledge enabling industry to develop new technologies that increase U.S. hydropower and marine and hydrokinetic (MHK) generation. Hydropower and MHK energy technologies generate renewable electricity that supports domestic economic prosperity and energy security while enhancing the reliability and resiliency of the U.S. power grid.

MHK technologies convert the energy of waves, tides, and river and ocean currents into electricity and have the potential to provide locally sourced, clean, and reliable energy. MHK is a predictable, forecastable resource with a generation profile complimentary to the seasonal or temporal variations of other renewable resources such as onshore wind and solar, which can enhance its contributions to grid resilience and reliability. MHK technologies also have the potential to provide cost-effective energy for numerous existing maritime markets, including non-grid connected or remote coastal areas, ocean-based sensors, monitoring equipment (for civilian, scientific, industrial, and national security functions), and autonomous vehicle recharging at sea, as well as reducing desalination costs by avoiding the step of generating electricity.

Applications may be submitted to any of the subtopics below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis; and~~,~~
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

During Phase II, DOE may consider providing additional resources for up to 150 labor-hours at one or more national laboratories ~~time~~ in addition to the SBIR/STTR funding to the applicants if needed. Such national laboratory resources may be useful ~~to assess~~ for testing and performance assessment. If the applicant(s) desire such national laboratory resources they must include a description of the resources required.

Grant applications are sought in the following subtopics:

a. Microgrid for Improved Resilience in Remote Communities through Utilization of Marine Hydrokinetics and Pumped Storage Hydropower

Applications are sought ~~for developing~~ to prove the concept of microgrids for remote rural communities. Applicants should show how such microgrids ~~that~~ enhance the ability of marine hydrokinetics (MHK) technologies to contribute to grid reliability and resilience. Inclusion of MHK should offer the capability to reliably provide base load power in these communities in a resilient manner. ~~.~~The application should demonstrate how MHK ~~that~~ is less exposed to extreme weather events than other renewable resources.

In 2017, the National Academy of Sciences found that "~~"~~There is enormous technical potential to using microgrids to make electric service more resilient. This field of research and application is evolving quickly with new control systems, sensors, and distributed energy sources. This rapid evolution of the frontier of technical capabilities is opening a potentially wide gulf between the technical capabilities of microgrid systems and the real world systems that are operational."~~"~~ To help bridge this gulf, ~~the~~ WPTO is interested in proof of concept research on real world applications of marine renewable energy (MRE) technologies that can operate as a base load power supply ~~in~~ for small microgrid systems (100KW-1MW) ~~to~~ that provide power to remote communities. The proof of concept research should demonstrate the extent to which the following assertions are true:

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- Remote rural communities that are vulnerable to power outages resulting from extreme weather events can benefit from microgrids because they are more resilient power supply systems.
- Mi~~M~~icrogrids from renewable power sources ~~also have the potential to~~can reduce energy costs in communities that are dependent on diesel fuel for power.
- Incorporating Marine current energy devices into microgrids can reduce their ~~, In particular, are less~~ expose~~d~~ure to extreme weather events ~~and thus more resilient than~~ compared with other renewable sources.
-

Phase I awards under this topic will prove the concept for ~~evaluate the Feasibility of a~~the proposed microgrid based on the following:

- Identification of a specific rural community, with average annual electrical demand 100KW-1MW, that currently relies on diesel generators (DG) as primary power supply, and has nearby current energy (river or tidal) resources available to support microgrid operations;~~.~~
- Possible inclusion of pumped-storage hydropower (PSH), utilizing either natural or man-made water reservoirs, for energy storage requirements to meet electrical grid requirements~~.~~;
- ~~The system is intended to r~~Replacement of the DGs, though DGs can be included for back-up power, i.e. the system should be capable of operating with the MHK devices supplying baseload operations without utilization of DG~~diesel generators~~.
- ~~The study should i~~Inclusion of~~de~~ preliminary designs, including specific inverters, controllers and other major component requirements, and the associated system life cycle cost estimates~~.~~; and

- ~~The study should compare l~~Life cycle cost comparisons for proposed system, based on available resources for particular community of interest, to the cost associated with the community's current ~~diesel generator~~DG operations, maintenance and fuel.

Phase I should include component level testing required to complete the system design.~~-~~ It should also include testing plans to occur in the specific laboratory environment proposed for phase two.
The proposed research ~~The study~~ should identify and model a system consisting of optimal mix of renewable and other local energy resources as appropriate, as well as storage requirements, to serve the community's energy needs.

In Phase II the researchers would ~~awards under this topic will~~ complete design and test the system in a laboratory environment utilizing Hardware in the Loop (HIL) to the greatest extent practical at facility such as NREL's National Wind Technology Center (NWTC) or the University of Alaska, Fairbanks' Power Systems Integration Lab at the Alaska Center for Energy and Power (ACEP).

Phase II must also include an evaluation of global potential for microgrids for improved resilience in remote communities with average annual electrical demand 100KW-1MW through utilization of MHK and PSH.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

b. Ocean Energy Storage Systems

Energy storage is a critical component of renewable energy systems to overcome intermittency. Research on electrochemical storage methods, and integration with renewable energy generation sources, has thus far focused on land-based systems such as solar and onshore wind. Generally these systems are poorly suited for the marine environment and are not optimized for integration with marine energy systems such as wave energy converters or tidal energy turbines. The WPTO has identified numerous non-grid applications that could benefit from marine energy, but nearly all of them require an energy storage component. Examples include charging underwater vehicles at sea, powering ocean research devices, and providing emergency sources of electricity. For a marine energy converter to successfully enter these markets it must have a well-defined and reliable energy storage system.

WPTO seeks to fund research and development on ~~f~~novel ocean energy storage systems that can provide functions similar to electrochemical battery storage and are designed for integration with marine energy systems.~~-~~ Examples ~~of research~~ could include systems using pneumatic, hydraulic, or thermal energy storage. Ocean energy storage could also include systems that are analogous to compressed air energy storage (CAES) or pumped-hydro storage (PHS), but operate underwater using the weight of the water column to pressurize a fluid or gas. Novel electrochemical storage systems that require ocean water for operation may be considered if marine energy conversion is clearly described as an integral component of the design. ~~-~~The WPTO will consider technologies for various scales and capacities, though the end use application must be clearly identified.

Phase I awards under this topic will carry out early-stage, proof-of-concept research into novel marine energy storage concepts in a laboratory setting. ~~-~~Phase I research should involve definition~~e~~ and design of a storage system and ~~perform~~ sufficient laboratory testing to inform the relative merits of the technology and its potential for scaling-up or commercialization. Phase I ~~L~~laboratory work may include initial research to guide

design. It also may include, testing of initial components and designs, or other necessary steps in early-stage development. In Phase II, the awardee(s) will should continue to develop the proposed ocean energy storage system identified in Phase I by building a functioning prototype system and testing it in an intended environment or in a laboratory setting using hardware-in-the-loop testing regime. Phase II awardee(s) must present a clear path for the commercialization of the proposed technology.

Applicants must demonstrate knowledge, experience, and capabilities in developing ocean energy storage systems and include the following in their application:

- A clear description of the specific end-use application for the storage system; for example, charging underwater vehicles or aerial drones, balancing the grid, or offshore aquaculture farms.;
- Required system components, including but not limited to: interconnection, mating, or delivery hardware that allows the storage system to deliver energy to the specified application (e.g. docking station for underwater vehicles or drones), ; including the power management system and controllers and; other auxiliary systems;,
- If applicable, how the system can be charged by marine energy systems such as wave, tidal, or ocean current energy converters;,
- The state-of-the-art for incumbent technologies and how the proposed design will overcome existing limitations or pain points faced by end-users.;
- Capacity rating, rates of charge and discharge, and cycling characteristics of the proposed system should be included;
- Details of work to be performed in Phase I including the design plan, the resources required, and the intended performance targets; and
- Description of Phase II work including the scale of the demonstration prototype, the desired test location or facility, and if possible, end-user partners.

Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, what the commercialization plan is for the energy storage system to be developed under this subtopic.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

c. Pumping and Compression using Marine and Hydrokinetic Energy

Water pumping is required for many different types of operations, including: a) cooling for manufacturing, and data centers, b) air conditioning, or c) power generation plants;, d) seawater desalination, e) irrigation of crops,; f) onshore and offshore aquaculture, and g) or pumped-storage hydro, among many others. Compression is needed for refrigeration or other systems applications that use gases or compressible liquids as their working fluid.

Where When these applications are exist in off-grid areas, the power for pumping or compression is typically provided by diesel generators. (b) (5) MHK may be able to supplant these costly and polluting fossil fuel powered pumps and compressors using the energy contained in oceans and rivers.

MHK pumping has often been considered for desalination systems, in particular wave powered reverse osmosis systems. However, challenges remain in determining how best to integrate ~~these~~ MHK technologies. Wave energy converters often act as intermittent positive displacement pumps, delivering seawater at variable flow and non-constant pressures, occasionally resulting in water hammer effects. ~~-~~These pressure fluctuations can be damaging for downstream system components, such as membranes, filters, heat exchangers, or valves. Research addressing these issues is elemental to many different off-grid applications for MHK technologies that require pumping or compression, as well as riverine applications such as freshwater aquaculture or crop irrigation.

WPTO seeks to fund research and development of novel MHK-powered pumping or compression systems to directly pump water or compress gases for off-grid applications. Steady flow, high-head (for pumping systems), high-efficiency designs with minimal maintenance are of particular interest. ~~-~~Research should identify specific end-users or applications for the system and clearly demonstrate how the proposed technology meets customer needs.

Phase I awards under this topic will carry out early-stage, proof-of-concept research into novel MHK pumping or compression systems. Phase I research should ~~define and~~involve design of a pumping or compression system and should involve ~~perform~~ sufficient laboratory testing to inform the relative merits of the technology compared to incumbent technologies and its potential for scaling-up or commercialization. Consideration must be given to the delivery system which will deliver the working fluid to the end-user or application. In Phase II the awardee(s) will continue to develop the proposed MHK pumping or compression system by building a functioning prototype and testing in an intended environment or in a laboratory setting using a hardware-in-the-loop testing regime.

Applicants must demonstrate knowledge, experience, and capabilities in developing MHK pumping systems and include a description of the following in their application:

- ~~A clear description of t~~The specific end-use application for the pumping or compression system and how it will meet end-user requirements, e.g. wheat crop irrigation in remote communities to supply 10 m3/hr with a total dynamic head of 150 meters for a pumping system;
- The MHK resource that will be used to power the system;~~.~~
- The state-of-the-art for incumbent technologies and how the proposed design will overcome existing limitations, costs, or other pain points faced by end-users~~.~~;
- The predicted volumetric flow rate, total dynamic head, and other relevant calculated performance characteristics of the intended system as applicable~~.~~;
- The predicted electrical power or fuel displaced by the proposed design;~~.~~
- Details of work to be performed in Phase I including the design plan, the resources required, and the intended performance targets~~.~~; and
- ~~Description of~~ The Phase II work including the scale of the demonstration prototype, the desired test location or facility, and if possible, end-user partners.

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Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, the commercialization plan for the MHK pumping or compression system to be developed under this topic.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

d. High Value Critical Mineral Extraction from the Ocean Using Marine Energy

The demand for reliable sources of critical minerals is growing, based on likely future scarcities and security concerns for obtaining minerals from international sources that may not be readily accessible to the United States. Most rare earth elements (REEs) and valuable minerals used in the United States are imported from other nations. This reliance on foreign supply constitutes an industrial and national security concern. -The development of lower-cost domestic extraction of minerals from the ocean will make these sources more economically attractive and~~;~~ help alleviate international supply concerns.~~.~~; Use of ocean sources of critical materials also will ~~and relieve~~ avoid permitting, waste disposal, and public opinion concerns ~~for~~ associated with terrestrial mining operations. Of particular importance are those elements for which the United States does not have significant domestic resources or for which there is significant risk of supply disruption. Elements that are considered critical include the REEs (e.g., neodymium, dysprosium, europium, yttrium, and terbium), lithium, tellurium, gallium, and indium.

Seawater contains large amounts of minerals, dissolved gases, and specific organic molecules that can play a role as energy sources or ~~in~~ for other industrial uses. Some of the most valuable minerals include the 17 REEs, precious metals, lithium, and uranium. Seawater minerals are generally distributed evenly in seawater. These minerals can be recovered from seawater using adsorption methods that do not require filtering vast amounts of seawater.

Marine Energy could open up unexploited opportunities in seawater mining, which could further expand mineral and gas markets. Seawater mining would also improve the diversity of the U.S. mineral supply chain, eliminating reliance on any one supplier. The availability of marine sources of critical material would ~~, and~~ provide a price ceiling on the cost of terrestrially obtained critical materials. Extraction of minerals from seawater requires power to operate mechanical adsorbent exposure mechanisms, pump seawater, and operate the electrochemical cell in electrochemical extraction systems.

WPTO seeks applications for developing alternatives to foreign-sourced critical materials using marine energy to address US security, trade gaps, and mineral scarcity. Critical materials include, but are not limited to, rare earth elements.

In Phase I awardees will carry out (1) ~~a~~ proof of concept research which includes appropriate lab testing for extracting minerals from sea water using marine energy; (2) a study to understand economics and scales to extract high value minerals commercially; and (3) development of ~~design~~ a prototype for testing in Phase II. -In Phase II the awardee(s) will build and test a promising mineral extraction technology powered by a small scale marine energy device.

Applicants must also demonstrate knowledge, experience, and capabilities in marine energy capture as well as an understanding of sea water mineral extraction technologies and include the following descriptions in their application:

- ~~Description of~~ Tthe required marine energy generation infrastructure and power requirements;
- ~~Description of~~ Mmineral extraction technologies and efficiencies being considered;
- Concepts on platforms for concentrated mineral solute transfer or similar materials transfer;
- ~~Identification of~~ Tthe US mineral trade gaps-/-mineral security that could be commercially addressed by this technology;
- US Exclusive Economic Zone (EEZ) siting options with marine energy resource assessment alignment for: wave, tidal, current, and/-or OTEC;
- Details of work to be performed in Phase I; and
- ~~Description of~~ Phase II work including use of national lab resources if desired by the applicant.

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Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, the commercialization plan for high value mineral extraction from the ocean using marine energy to be developed under this topic.

Questions – Contact: Rajesh Dham, rajesh.dham@ee.doe.gov

Subtopic a) References:

[1] National Academies of Sciences, Engineering, and Medicine. 2017. Enhancing the Resilience of the Nation's Electricity System. Washington, DC: The National Academies Press.
[2] Burr, Michael, Camilleri, John, Lubkeman, David, Long, Qian, and Du, Yuhua. Microgrid optimized resource dispatch for public-purpose resiliency and sustainability. United States: N. p., 2017. Web.
[3] Baring-Gould, Edward I., Haase, Scott G., Jimenez, Antonio, and Olis, Daniel R. Kokhanok Renewable Energy Retrofit Analysis. United States: N. p., 2017. Web. doi:10.2172/1418968.
[4] Giraldez Miner, Julieta I, Singh, Shruti, and Gao, David Wenzhong. Cost Analysis of Renewable Energy-Based Microgrids. United States: N. p., 2017. Web. doi:10.1109/NAPS.2017.8107241.
[5] -Hernando, Daniel, Farahmand, Hossein, Holttinen, Hannele, Kiviluoma, Juha, Rinne, Erkka, Söder, Lennart, Milligan, Michael, Ibanez, Eduardo, Martínez, Sergio Martín, Gomez-Lazaro, Emilio, Estanqueiro, Ana, Rodrigues, Luis, Carr, Luis, van Roon, Serafin, Orths, Antje Gesa, Eriksen, Peter Børre, Forcione, Alain, and Menemenlis, Nickie. Hydro power flexibility for power systems with variable renewable energy sources: an IEA Task 25 collaboration: Hydro power flexibility for power systems. United States: N. p., 2016. Web. doi:10.1002/wene.220.

Subtopic b) References:

[1] EnergieSpeicher. 2017. "Storing energy at sea." http://forschung-energiespeicher.info/en/projektschau/gesamtliste/projekt-einzelansicht/95/Kugelpumpspeicher_unter_Wasser/
[2] Shepard News. 2015. "US works on underwater UUV recharging." August 25. 4137 https://www.shephardmedia.com/news/uv-online/us-works-underwater-uuv-recharging/.

[3] The Economist. 2016. "Depths of imagination: Pumped storage gets a makeover." https://www.economist.com/science-and-technology/2016/11/05/depths-of-imagination
[4] Townsend, Nicholas, and Ajit Shenoi. 2013. "Recharging autonomous underwater vehicles from ambient wave 4175 induced motions." Oceans. San Diego, CA. September 23–27, 2013.

Subtopic c) References:

[1] Energy Smarts. 2013. "Massachusetts Oysters Go Solar." March 27. http://blog.mass.gov/energy/green-3748 business/massachusetts-oysters-go-solar/.
[2] Google Data Centers. n.d. "Efficiency: How we do it." Accessed April 7, 2018. 3808 https://www.google.com/about/datacenters/efficiency/internal/.
[3] Gunawan, Budi, Vincent S. Neary, Josh Mortensen, and Jesse D. Roberts. 2017. Assessing and Testing 3824 Hydrokinetic Turbine Performance and Effects on Open Channel Hydrodynamics: An Irrigation Canal Case 3825 Study. U.S. Department of Energy, DOE/EE-1537. 3826. https://www.energy.gov/sites/prod/files/2017/04/f34/Assessing-Testing-Hydrokinetic-Turbine-Performance-3827 Effects.pdf.
[4] Toner, Damien, and Mo Mathies. 2002. "The Potential for Renewable Energy Usage in Aquaculture." 4173 Aquaculture Initiative. 54 pp. http://www.aquacultureinitiative.eu/Renewable%20Energy%20Report.pdf.

Subtopic d) References:

[1] DE-FOA-0001885: RFI: Marine and Hydrokinetic Technologies: Maritime Markets Report - Potential Maritime Markets for Marine and Hydrokinetic Technologies: Draft Report April 2018 – Chapter 7 Seawater Mining: Minerals and Gasses
https://eere-exchange.energy.gov/#Foaidb8a4d4f5-1398-438d-afe1-876763816a8c

9. WIND

Maximum Phase I Award Amount: (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Office of Energy Efficiency and Renewable Energy's Wind Energy Technologies Office (https://energy.gov/eere/wind/wind-energy-technologies-office), seeks applications for innovations that significantly reduce the cost of energy from U.S. wind power resources for land-based, offshore and distributed wind turbines. The Wind Energy Technologies Office (WETO) is seeking proposals for technology innovations with the potential to enable wind power to generate electricity offshore and in all 50 states cost competitively with other sources of generation.

Today, wind energy provides over 6% of the nation's total electricity generation. At the end of 2017, over 81,000 wind turbines, totaling 1,076 megawatts (MW) in cumulative capacity, were deployed in distributed applications across all 50 states, the District of Columbia, Puerto Rico, Guam, and the U.S. Virgin Islands. Additionally, 89 gigawatts (GW) of utility-scale wind turbines are installed across 41 states plus Puerto Rico and Guam. Finally, one of the smallest states in terms of both geographic size and installed wind capacity marked a major milestone in 2016, as the nation's first offshore wind project, the 30 MW Block Island project in Rhode Island, achieved commercial operation. With wind power generation exceeding 10% in 14 states, wind is a demonstrated clean, affordable electricity resource for the nation.

WETO aims to advance scientific knowledge and technological innovation to enable clean, low-cost wind energy options nationwide. WETO Research, Development, Demonstration and Deployment (RDD&D) activities are applicable to utility-scale land and offshore wind markets, as well as distributed turbines—typically interconnected on the distribution grid at or near the point of end-use. Achieving LCOE goals will support deployment of wind at high penetration levels, sufficient to meet up to 20% of projected U.S. electricity demand in 2030, and up to 35% in 2050, compared to over 6% of demand in 2017. DOE plays a unique and valuable role in enabling the wind industry and its stakeholders to meet core challenges to industry growth through innovation to reduce wind technology costs and mitigate market barriers enables deployment and drives U.S. economic growth.

All applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. Vision or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis and; justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Coordinated and Secure Distributed Wind System Control and Communications Technologies

(b) (5)

(b) (5)

Early stage research and technology development is needed for higher penetrations of distributed energy resources (DERs) to integrate with existing electricity distribution networks, contribute to grid reliability, and provide resilience when the bulk power system fails. Interoperability between wind technology and other distributed energy resources (e.g. solar and storage) and the flexible electricity loads they support (e.g. buildings) can enable higher penetration through coordinated and secure controls and communications technologies. The goal of this subtopic is to make these capabilities available for wind energy technology, at all scales used in distributed applications, through the development of low-cost, validated and secure control and communication technologies. Proposals should address technical challenges related to wind technology specifically in Phase I, while addressing the common communication and cybersecurity requirements for all

distributed energy resources. In addition, proposals should consider how to complement solar and/or storage technologies to advance the interests of multiple EERE programs in Phase II. [1, 2]

(b) (5)

Questions -- contact Michael Derby, michael.derby@ee.doe.gov

b. Remote Diagnostic Technologies to Reduce Offshore Wind Operating, Maintenance, and Repair Costs, and Increase System Reliability

(b) (5)

Accessing an offshore wind turbine for service work is far more expensive than accessing a land-based wind turbine – technicians need to be transported long distances by boat, which requires more personnel and time, and can be delayed by weather. This, in turn, increases overall operations and maintenance (O&M) costs for an offshore wind plant, as well as lost revenue caused by unplanned downtime. Remote monitoring, inspection, and repair of offshore wind turbines and foundations can reduce O&M costs and avoid losses in energy production. To date, the field of remote diagnostics for offshore wind is not well-developed in the global marketplace and could benefit from adaptation of advanced technologies, materials and manufacturing processes being developed by U.S. firms for other applications. The larger scale, greater distances from shore, and generally harsher operating conditions of planned U.S. offshore wind projects compared to those in

Europe, where most offshore development to date has taken place, provide an impetus for U.S. innovation in remote diagnostic technologies, while also resulting in significant global market potential.

WETO is seeking proposals for development or adaptation of innovative technologies to increase offshore wind plant operators' abilities to remotely monitor operating details of turbines and component subsystems in order to plan service events in advance of possible failures, and decrease the need for on-site technician time. Innovative technologies to be proposed may include hardware, sensors, instruments, and/or software tools. These technologies can facilitate maintenance and repair processes, such as: detection of a system operating outside of its normal parameters, inspection and identification of the root cause of the problem, quantification of how it will impact overall health of the machine, decision making on the proper course of action, and planning the repair or other preventative measures. If included as part of innovative hardware development, software may utilize advances in artificial intelligence and should ensure cyber security of the wind plant. WETO is seeking solutions to address a broad range of factors impacting reliability, therefore proposed technologies may be applicable to specific elements of an offshore system including blades, foundations, turbine mechanical, turbine electrical, and control electronics. Any hardware developed must be able to function reliably in harsh marine environments, and should integrate into the supervisory control and data acquisition (SCADA) system of the turbine and the wind plant. [3~~,~~4, 4]

Questions – contact Michael Derby, michael.derby@ee.doe.gov

c. ~~Other in~~ Wind Turbine Blade Recycling

In addition to the specific subtopics listed above, WETO invites grant applications in other areas relevant to wind turbine blade recycling that enable wind power nationwide [5,6].

Questions – contact Michael Derby, michael.derby@ee.doe.gov

Subtopic a) References:

[1] Distributed Wind Energy Association (DWEA), 2015, DWEA Distributed Wind Vision – 2015-2030 Strategies to Reach 30 GW of "Behind-the-Meter" Wind Generation by 2030, p. 26. (http://distributedwind.org/wp-content/uploads/2012/08/DWEA-Distributed-Wind-Vision.pdf)
[2] Jenkins, J., Rhoads-Weaver, H., et al., 2013, SMART Wind Roadmap: A Consensus-Based, Shared-Vision Sustainable Manufacturing, Advanced Research & Technology Action Plan for Distributed Wind, Distributed Wind Energy Association, Durango, Colorado, p. 110. (http://distributedwind.org/wp-content/uploads/2016/05/SMART-Wind-Roadmap.pdf)

Subtopic b) References:

[3] U.S. Department of Energy, 2015, Wind Vision: A New Era for Wind Power in the United States, p. 350. doi:10.2172/1220428 (http://energy.gov/sites/prod/files/2015/03/f20/wv_full_report.pdf)
[4] U.S. Department of Energy, U.S. Department of Interior, 2016, National Offshore Wind Strategy: Facilitating the Development of the Offshore Wind Industry in the United States, p. 84. (http://energy.gov/sites/prod/files/2016/09/f33/National-Offshore-Wind-Strategy-report-09082016.pdf)

Subtopic c) References:

[5] U.S. Department of Energy, 2015, Enabling Wind Power Nationwide, p. 56. doi:10.2172/1220457 (http://energy.gov/sites/prod/files/2015/05/f22/Enabling-Wind-Power-Nationwide_18MAY2015_FINAL.pdf)
[6] Larsen, H.H., & Sønderberg Petersen, L., 2014, DTU International Energy Report 2014: Wind Energy — Drivers and Barriers for Higher Shares of Wind in the Global Power Generation Mix, Technical University of Denmark, p. 91-97. (http://orbit.dtu.dk/files/102457047/DTU_INTL_ENERGY_REP_2014_WIND.pdf)

10. JOINT TOPIC: ADVANCED MANUFACTURING AND SOLAR ENERGY TECHNOLOGIES OFFICES

Maximum Phase I Award Amount (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Solar Energy Technologies Office (SETO) supports early-stage research and development to improve the affordability, reliability, and performance of solar technologies on the grid. A specific effort is devoted to cutting-edge research and development that will help the solar industry to reduce the cost of manufacturing solar technologies to reach the 2030 cost targets [2, 3].

In this Topic, AMO and SETO seek applications for the development of innovative and impactful technologies that will support a strong solar manufacturing sector and supply chain in America, while producing cost-competitive modules that keep pace with the rising domestic and global demand for affordable solar energy. Applications must be responsive to the following subtopic. Applications outside of this area will not be considered. Within this topic, DOE is not interested in technologies and innovations related to racking optimization or mounting technologies. Applications in this space will be deemed non-responsive. However, any innovation in module form factors should have a line of sight to easy deployment using current or soon to come racking/mounting technologies.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Applicants are encouraged to leverage capabilities of consortia from both AMO and SETO. The Rapid Advancement in Process Intensification Deployments (RAPID) Institute is one of AMO's public-private R&D consortia where manufacturers, small businesses, universities, national laboratories, and state and local governments are brought together to pursue coordinated early-stage R&D in high-priority areas essential to

energy in manufacturing, including module manufacturing [4]. SETO's Durable Module Materials (DuraMAT) Consortium [5], brings together national laboratories, universities, and industry to discover and develop new materials, testing methodologies, and designs for durable PV systems.

Grant applications are sought in the following subtopic:

a. Innovation in solar module manufacturing processes and technologies

The global PV market has changed dramatically over the past years. Module prices have been decreasing rapidly and global deployment is experiencing strong growth. However, manufacturing is concentrated mainly in Asia [6]. Innovation-driven cost, performance and quality improvements, along with strong projected solar demand in the United States and across the Americas, could increase the attractiveness of U.S.-based solar manufacturing. Although improvements to standard PV modules have produced deep cost reductions over the past years, the returns on such improvements appear to be diminishing, and more dramatic innovations in module design and manufacturing may be needed to maintain the path of rapid progress while opening further opportunities for domestic manufacturing.

Within the solar manufacturing value chain, module manufacturing represents one of the areas where innovation can be still introduced. Capital expenditures (CapEx) for a new module assembly line is lower relative to other components such as wafers and solar cell, but the process still requires several steps, some of them quite slow (e.g. lamination).

AMO and SETO are looking for new module manufacturing technologies, equipment development, individual process step innovation that can accomplish one or more of the following objectives:

- ~~13.~~ Modifications and repurposing of existing or dormant manufacturing technologies in order to utilize an existing infrastructure and demonstrate synergies with existing or new module technologies;
- ~~14.~~ Reduction of the number of steps in a module assembly (from cells or completed thin film device stack to completed module);
- ~~15.~~ Development of new tools or technologies that will increase the throughput of existing or new processes;
- ~~16.~~ Development of new module assembly technologies, methods and improved form factors that optimize module cost per watt;
- ~~17.~~ Development of module manufacturing methods that enable incorporation of new and upcoming cell technologies such as perovskite or other high efficiency solar cells such as monolithic module manufacturing methods;
- ~~18.~~ Development of new module technologies and equipment that lower the tool footprint or optimizes usage of the factory floor;
- ~~19.~~ Replacement of manufacturing bottlenecks (e.g. lamination, encapsulation) with faster and more efficient processes; and

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10. Development of techniques that could allow for the manufacture of mechanically staked or fully integrated tandem technologies.

In the Phase I of these projects, DOE expects applicants to analyze the feasibility of a new technology or process, identify and do preliminary work with relevant stakeholders to ensure easy access to facilities to test, validate, and prototype the new design. A prototype should be developed with the goal to embed or test it in a real-world assembly line or a dormant facility during Phase II.

Questions – contact solar.sbir@ee.doe.gov and Dickson.Ozokwelu@ee.doe.gov

References:

[1] https://energy.gov/eere/amo
[2] https://energy.gov/solar-office
[3] https://www.energy.gov/eere/solar/goals-solar-energy-technologies-office
[4] https://www.aiche.org/rapid
[5] https://www.duramat.org/capabilities.html
[6] https://www.nrel.gov/docs/fy16osti/65788.pdf

11. JOINT TOPIC: ADVANCED MANUFACTURING AND GEOTHERMAL TECHNOLOGIES OFFICES

Maximum Phase I Award Amount: (b) (5) $200,000	Maximum Phase II Award Amount: (b) (5) $1,100,000
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Geothermal Technologies Office (GTO) focuses on applied research, development, and innovations that will improve the competitiveness of geothermal energy, as to generate high-capacity factor dispatchable electricity, and in direct-use applications for heating and cooling of American homes and businesses. Domestic geothermal energy enables (b) (5) energy security, resiliency, and a strong domestic economy in emerging technologies [2].

In this Topic, AMO and GTO partner to solicit innovative research and development projects capable of addressing both critical material and critical water issues. This topic supports the priorities of the Acting Assistant Secretary for EERE to address (1) critical water issues: improve long-term access to clean, affordable water supplies, including technical challenges at the nexus of energy and water (energy used to produce clean water and water used in energy production) and identify ways to produce and ensure the availability of water during long term outages; and (2) critical materials: developing technologies to reduce the impediments to domestic critical materials production, finding alternatives to foreign-sourced critical materials, and developing technologies to reuse and recycle critical materials.

The Phase I application should detail design and bench scale systems that are scalable to a subsequent Phase II prototype development. Applications must be responsive to the following subtopic. Applications outside of this area will not be considered.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to baselines from the EERE Study [3];
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Geothermal Desalination and Critical Material Recovery Systems

Desalination systems take an impaired water source and produce fresh water and a concentrated brine waste stream. A typical source is seawater with approximately 35,000 ppm total dissolved solids (TDS), but other sources can include coal tailing, industrial waters, and produced waters from oil and gas, which have higher TDS. The concentrated brine byproduct is a good target for mineral recovery operations because the critical material(s) of interest will occur in higher concentrations which may improve the economics for their recovery.

To be responsive to this topic, the small business must propose a research and development project that aims to commercialize a system that will accomplish both desalination and recovery of a critical material. For this subtopic, the process must use a geothermal heat source. Specifically, the system must yield fresh water with less than 500 ppm TDS while recovering at least one critical material, which can include, but is not limited to, rare earth elements. A comprehensive list of 35 mineral commodities deemed critical under the definition from Executive Order 13817 was recently published by the Secretary of the Interior [4].

Because the material recovery and water processing scale differently to address their commercial needs, it is recommended that each applicant select a primary goal for their system (i.e., design a critical material recovery system that is capable of treating water or vice versa). The current benchmark for thermal seawater desalination is multi-stage flash whose energy intensity is estimated at 15 kWh per meter cubed with approximately 11 kWh coming from thermal energy [3]; however, more efficient thermal desalination systems are currently under development and energy intensity can vary increase significantly for higher TDS source waters.

Under this subtopic, the system must be tailored to make use of geothermal heat, with low temperature geothermal resources (<150 °C) being of particular interest in this application. These resources can come from lower temperature geothermal reservoirs or from cascaded applications from higher temperature geothermal resources. The impaired water sources primarily of interest in this subtopic are geothermal brines and produced waters from oil and gas.

Questions -- contact Joshua.mengers@ee.doe.gov

b. Desalination and Critical Material Recovery Systems from Other Energy Sources

In addition to the specific subtopic listed above, the Department also solicits applications that fall within the specific scope of the topic description above. Specifically, this subtopic will allow systems that use energy sources other than geothermal and will focus on systems that propose improvements in energy efficiency by at least 30%. The baseline for current typical energy intensity for seawater desalination is reverse osmosis at 3.3 kWh per cubic meter yielding costs of nearly $2 per cubic meter [3].

Questions -- contact Tara.Gonzalez@ee.doe.gov

References:

[1] Advanced Manufacturing Office Website: https://energy.gov/eere/amo
[2] Geothermal Technologies Office Website: https://energy.gov/eere/geothermal
[3] "Bandwidth Study on Energy Use and Potential Energy Savings Opportunities in U.S. Seawater Desalination Systems." EERE Report, October, 2017
https://www.energy.gov/sites/prod/files/2017/12/f46/Seawater_desalination_bandwidth_study_2017.pdf
[4] "Final List of Critical Minerals 2018." Federal Register, Vol. 83, No. 97, May 18, 2018
https://www.gpo.gov/fdsys/pkg/FR-2018-05-18/pdf/2018-10667.pdf

12. JOINT TOPIC: ADVANCED MANUFACTURING AND FUEL CELL TECHNOLOGIES OFFICES

Maximum Phase I Award Amount: (b) (5) $200,000	Maximum Phase II Award Amount: (b) (5) $1,100,000
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Fuel Cells Technologies Office (FCTO) focuses on applied research, development, and innovation to advance hydrogen and fuel cells for transportation and diverse applications enabling energy security, resiliency, and a strong domestic economy in emerging technologies [2].

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;

- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Applications must be responsive to the following subtopic. Applications outside of this area will not be considered.

Applications are sought in the following subtopic:

a. Advanced Materials for Detection and Removal of Impurities in Hydrogen

High-performance membrane technologies have been explored in recent years for their potential to detect and remove contaminants from streams of hydrogen gas, to serve applications requiring high purities (e.g. petroleum refineries, glassmaking plants or hydrogen fueling stations) [3]. Today, the primary approaches to management of contamination are: (1) ~~the use~~ pressure swing adsorption techniques at centralized hydrogen production facilities, and (2) ~~design of~~ distribution infrastructure technologies to mitigate the introduction of contaminants. Nevertheless, excursions can take place.; ~~examples~~ Examples of sources of potential contamination include lubricating oil in compressors, off-gassing from polymers, or residual water from steam methane reformers or electrolysis [3]. Contaminants can permanently deactivate catalysts (e.g. within upgrading equipment at refineries, or in fuel cells onboard vehicles). Current inline detectors at hydrogen filling stations for fuel cell vehicles are incapable of removing contaminants, or shutting down a dispenser in time to prevent them from reaching the vehicle.

This subtopic seeks concepts that can both detect and remove high-priority contaminants from hydrogen fuel. Concepts proposed should be capable of continuous operation at 875 bar and -40°C, such that the unit developed can be installed immediately upstream of a hydrogen dispenser. Contaminants of particular interest, based on their likelihood of occurrence and the level of damage they can do to a fuel cell, are: water, carbon monoxide, total sulfur, ammonia, and total hydrocarbons [4]. Phase I of proposed projects should develop and evaluate potential materials that are capable of removing water, carbon monoxide, sulfur, and hydrocarbons from hydrogen fuel at stations to SAE J2719 levels [5], and design a concept that can both detect and remove contaminants. The designed system should be easily removable and replaceable once the expected lifetime expires. Concepts proposed should target a capital cost of <$5,000 and an annual operating cost of (b) (5)$1,100. Phase II may include the development and experimental evaluation of a prototype.

Questions – contact neha.rustagi@ee.doe.gov and tara.gonzalez@ee.doe.gov

References:
[1] https://energy.gov/eere/amo
[2] https://www.energy.gov/eere/fuelcells/fuel-cell-technologies-office
[3] https://www.energy.gov/sites/prod/files/2015/04/f21/fcto_2014_hcd_workshop_1_report.pdf
[4] https://www.nrel.gov/docs/fy15osti/64063.pdf
[5] https://www.sae.org/standards/content/j2719_201109/

FY 2019 EERE Small Business Innovation Research (SBIR) & Small Business Technology Transfer (STTR) Topics

Style Definition: List Paragraph,Paragraph Bullet: Indent: Left: 0.25", Numbered + Level: 1 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0.5" + Indent at: 0.75"

1. **ADVANCED MANUFACTURING**
   a. Manufacturing Cybersecurity
   b. Atomic Precision for Gaseous Separations
   c. Covetic Processing of Critical Materials and Strategic Materials
   d. Technology Transfer Opportunity: Electrochemical Recycling Electronic Constituents of Value (E-RECOV)
2. **BIOENERGY**
   ~~e.~~a. Cell-Free Biochemical Platforms to Optimize Biomass Carbon Conversion Efficiency
   ~~f.~~b. Reshaping Plastic Design and Degradation
   ~~g.~~c. Algae Engineering Incubator
3. **BUILDINGS**
   ~~h.~~a. Next Generation Residential Air Handlers
   ~~i.~~b. Novel Materials and Processes for Solid-State Lighting
   ~~j.~~c. Automated Point Mapping for Commercial Buildings
   d. Complementing Building Energy Modeling (BEM) with Non-Energy Analyses
   ~~k.~~e. Data Fusion for Building Energy Efficiency Projects
4. **FUEL CELLS**
   ~~l.~~a. Fuel Cell Membranes and Ionomers
   ~~m.~~b. Nozzles for High-Pressure, Low-temperature Gas Fills
   ~~n.~~c. Active Low Cost Thin Film Hydrogen Sensors
   ~~o.~~d. Smart Sensors for Structural Health Monitoring (SHM) of Composite Overwrapped Pressure Vessels (COPVs) of On-board Hydrogen Storage for Fuel Cell Electric Vehicles (FCEVs)
   ~~p.~~e. Innovative Concepts for Hydrogen Conversion to Liquid Hydrocarbon Fuels
5. **GEOTHERMAL**
   ~~q.~~a. Improved downhole telemetry for geothermal drilling
6. **SOLAR**
   ~~r.~~a. TECHNOLOGY TRANSFER OPPORTUNITY: Real-Time Series Resistance Monitoring in Photovoltaic Systems
   ~~s.~~b. TECHNOLOGY TRANSFER OPPORTUNITY: PV module Soiling Spectral Deposition Detector
   ~~t.~~c. Storage technologies to enable low-cost dispatchable solar photovoltaic generation
   ~~u.~~d. Hardened solar system design and operation for recovery from extreme events
   ~~v.~~e. Rural solar
   ~~w.~~f. Affordability, reliability, and performance of solar technologies on the grid
7. **VEHICLES**
   ~~x.~~a. Electric Drive Vehicle Batteries
   ~~y.~~b. SiC devices suitable for Electric Vehicle Extreme Fast Chargers
   ~~z.~~c. Reduction of Thermal and Friction Losses in Internal Combustion Engines
   ~~aa.~~d. Co-Optimization of Fuels and Engines
   ~~bb.~~e. Improving the Performance and Reducing the Weight of Cast Components for Vehicle Applications
   ~~cc.~~f. Low Cost, Lightweight, and High-Performance Fiber-Reinforced Composites for Vehicle Applications
8. **WATER**
   ~~dd.~~a. Microgrid for Improved Resilience in Remote Communities through Utilization of Marine Hydrokinetics and Pumped Storage Hydropower

~~ee.~~b. Ocean Energy Storage Systems
~~ff.~~c. Pumping and Compression using Marine and Hydrokinetic Energy
~~gg.~~d. High Value Critical Mineral Extraction from the Ocean Using Marine Energy

9. WIND

~~hh.~~a. Coordinated and Secure Distributed Wind System Control and Communications Technologies
~~ii.~~b. Remote Diagnostic Technologies to Reduce Offshore Wind Operating, Maintenance, and Repair Costs, and Increase System Reliability
~~jj.~~c. Other in Wind Turbine Blade Recycling

10. JOINT TOPIC: ADVANCED MANUFACTURING AND SOLAR ENERGY TECHNOLOGIES OFFICES

~~kk.~~a. Innovation in solar module manufacturing processes and technologies

11. JOINT TOPIC: ADVANCED MANUFACTURING AND GEOTHERMAL TECHNOLOGIES OFFICES

~~ll.~~a. Geothermal Desalination and Critical Material Recovery Systems
~~mm.~~b. Desalination and Critical Material Recovery Systems from Other Energy Sources

12. JOINT TOPIC: ADVANCED MANUFACTURING AND FUEL CELL TECHNOLOGIES OFFICES

~~nn.~~a. Advanced Materials for Detection and Removal of Impurities in Hydrogen

PROGRAM AREA OVERVIEW: OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

The Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) supports early-stage research and development of energy efficiency and renewable energy technologies that make energy more affordable and that strengthen the reliability, resilience, and security of the U.S. electric grid. DOE resources are focused on early-stage R&D and reflect an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies. EERE emphasizes those energy technologies best positioned to support American energy independence and domestic job-growth. ~~EERE's fiscal year 2019 budget request can be found here: https://www5.eere.energy.gov/office_eere/current_budget.php.~~

1. ADVANCED MANUFACTURING

Maximum Phase I Award Amount: (b) (5) $200,000		Maximum Phase II Award Amount: (b) (5) $1,100,000	
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Advanced Manufacturing Office (AMO) (https://energy.gov/eere/amo) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Manufacturing Cybersecurity

Manufacturing is most vulnerable to cyber-attacks and disruption to processes, rather than to data -- and among manufacturing systems, industrial controls have been identified as most vulnerable. This issue is especially important for small and medium--sized manufacturing enterprises, which usually buy and use commercial control technology – and lack personnel dedicated to maintaining control system integrity.

Furthermore, many control systems in use in US manufacturing are older and are not easily upgraded due to cost and the need for a smaller manufacturer to maintain production without interruption.

This SBIR topic provides the opportunity for small businesses to work with industrial control developers, vendors, suppliers, standards organizations, and end users to investigate and develop cost-effective technology solutions to industrial control vulnerability. End users of special importance are small to medium-sized manufacturing enterprises that typically buy commercial control technology for their use and do not have the means to develop technology to ensure control security. Phase I~~1~~ grant applications for feasibility research are invited for the following subtopic areas:

- Encryption technology for digital control:- Many control loop signals are typically digitized at some point in manufacturing operations. D~~, d~~igital control is provided directly by Direct Digital Controllers DCC or Programmable Logic Controllers PLC. These controllers do not typically come with encryption technology, making digital signals susceptible to corruption. Phase I exploratory investigations for the development of digital control encryption technology are invited, especially for technology directed to legacy digital control circuitry that was not provided with encryption capability originally.
- Technology for redundancy checking in legacy control systems: -Manufacturing process corruption could appear as complete process disruption, or more insidiously through willful changes introduced almost imperceptibly over time. Phase I~~1~~ grant applications are invited for investigations in technology development for legacy control system integrity. Such technology is especially important for critical precision applications such as computer numeric controls applied in discrete parts manufacture.
- Wireless sensor signal encryption: -Most wireless sensors in industrial applications do not provide an encrypted signal to the control element or the controller. Those applications are vulnerable to willful disruption or ~~distortion,~~distortion. Analog or digital encryption would protect the integrity of the control system. Phase I~~1~~ grant applications are invited for wireless sensor encryption technology, and it is expected that investigators will work with appropriate standards and communications authorities for technology development that can be commercialized successfully.

Questions – contact Brian.Valentine@ee.doe.gov

b. Atomic Precision for Gaseous Separations

(b) (5)

Atomically precise is defined as: -Materials, structures, devices, and finished goods produced in a manner such that every atom is at its specified location relative to the other atoms, and in which there are no defects, missing atoms, extra atoms, or incorrect (impurity) atoms. Thus, we are targeting extraordinary materials that are essentially defect free. As deposition processes cannot produce defect-free structures, the only currently available assembly method is to design molecules that self-assemble into defect-free molecular layers. Proposals for methods that do not synthesize membranes using molecular self-assembly will be declined without review. Graphene-based layered membranes are explicitly excluded and proposals for graphene membranes will not be considered to be responsive.

We seek to further advance the development of this new class of strong, thin, and atomically precise membrane materials for separations that provide a 10X permeance improvement over State-of-the-Art polymer membranes. They would have thicknesses generally below 10 nm for high permeance, incorporate atomically precise molecular pores for 100% selectivity, be atomically flat to prevent fouling, and heavily cross-linked for environmental stability. These membranes offer the potential to provide game-changing process energy advances.

The subtopic seeks proposals focused on the separation of gases. The separation of gases into high value products can be game changing for a variety of energy applications. In principle, a series of membranes of sufficient selectivity could separate air into its raw components of N2, O2, Ar, CO2, Ne, He, etc. for U.S. manufacturing of high value products at a competitive advantage. Helium could also be effectively separated from particular natural gas sources where it is concentrated (in the Great Plains, for example) without the need for energy intensive cryogenic treatment. Ethane and propane could be separated from natural gas at low energy cost and sold profitably without the need or infrastructure for cracking, and CO2 could be removed from natural gas with low energy consumption to improve its heating value. CO2 could also be recovered from combustion gases at the source and reused as carbon feedstock for transformation to high value hydrocarbons [1-4].

Responsive proposals will (a) provide evidence that the respondent has the experience and capability to design atomically precise membranes via molecular self-assembly, (b) outline the approach to the molecular design, (c) include milestones and deliverables for physics-based modeling of the membrane, and (d) ideally provide for some synthesis and testing of the design. Whether or not a fully functional membrane is proposed for Phase I, there should be some chemical synthesis component to test out a key aspect of the approach; that is, this is not intended to be a "paper" study only. As this is a novel approach to the separation of gases, wider system design issues may also arise; these may be included as part of a proposal, but the main emphasis must still be on the novel molecular design.

Questions – contact david.forrest@ee.doe.gov

c. Covetic Processing of Critical Materials and Strategic Materials

Covetic nanomaterials are metals in which a network of graphene ribbons and nanoparticles has been created using an electrical conversion process in liquid metal [1-5]. Unlike ordinary graphene, the covetic phase exhibits exceptional stability – it persists after remelting and it resists being burned off in the ASTM E1019 method for carbon analysis. Covetics can conduct heat and electricity more efficiently than conventional metals, and appear to be more oxidation resistant. Covetic nanomaterials are likely to be commercially important because the process is inexpensively scalable to tonnage quantities. This implies the potential for widespread usage in thousands of energy production, transmission, and storage applications, and to improve energy efficiency for U.S. manufacturing. Cross-cut: The process is of interest to the Advanced Manufacturing Office because it can be performed on a wide range of commercially important critical materials and strategic materials and because it represents a leading-edge opportunity for US manufacturers. Key technical hurdles need to be addressed and low volume high-value-added applications need to be identified and pursued to introduce covetics into commercial production. Areas of particular interest include:

- Application development: We seek advances in covetic alloy development for low volume, high value-added applications as an entrée to commercialization. This may involve critical materials such as rare

earths, strategic materials [6] such as lithium and hafnium, high value alloys, or precious metals. We would like to see the process performed on previously unexplored elemental metals and alloys that make commercial sense. The proposed development effort should identify the low volume, high value-added target alloy and application, quantify the commercial potential, specify a plan for conversion and chemical analysis, and include the thermophysical and mechanical property tests to be conducted. The composition and amount of physical material to be made should be explicitly proposed. The processing of that material should be explicitly proposed, including conversion parameter windows, and particularly thermomechanical deformation parameters and heat treatment. AMO recognizes that there are a limited number of laboratories with the capability to make these materials.; Aapplicants should already have some experience in working with covetic nanomaterials or be partnered with those with experience. Proposals with applicants claiming the ability to make covetics, without prior proof of conversion (including enhanced thermal and electrical conductivity), will be declined without review.

- Chemical analysis: We seek advances in the ability to inexpensively analyze the levels of converted and unconverted carbon in covetics. ASTM E1019 does not seem to be effective in measuring the covetic phase [3], and there is an unresolved controversy in this method's ability to distinguish converted vs. unconverted carbon. GDMS also does not seem to be effective. Carbon analysis using Energy Dispersive Spectroscopy on SEM samples is susceptible to chamber contamination, can be expensive, and cannot distinguish between converted and unconverted forms. -The same goes for XPS, with the additional problem of poor statistics from small sample size. Raman and EELS can detect the graphene form but cannot provide good statistics on bulk concentrations because of the small sample volumes being measured. DC PES requires a full analysis of all trace elements, may be highly inaccurate at low carbon concentrations, and cannot distinguish between converted and unconverted forms of carbon. Responsive proposals should include a systematic approach (and novel techniques) to determine total carbon, unconverted carbon, and converted carbon. Specific metallurgical alloys or elements should be proposed with a justification for the expected successful outcome. We seek novel techniques, perhaps taking advantage of unique strong binding between the metal matrix and nanocarbon phase. AMO recognizes that there are a limited number of laboratories with the capability to make these materials.; Aapplicants should already have some experience in working with covetic nanomaterials or work with those with experience in order to obtain reference samples.
- Process development: -Laboratory synthesis of covetics has proven to be less than straightforward, with inconsistent conversion yields and wide variations in resultant properties. Batch conversion methods will not necessarily scale well to continuous production methods, and a "re-invention" of the process may be required in that case. We seek proposals that address fundamental improvements to the conversion process based on known issues and principles of physics and process metallurgy. T; these issues should be made explicit in the proposal. Applicants should have appropriate IP positions and agreements in place to proceed with process innovations. Responsive proposals will provide a clear exposition of the fundamental process issue, why this is a problem, and how the proposed work will address the issue and improve and advance the capability of the covetic conversion process. Upgrades to equipment infrastructure will be considered as part of the proposed work. Proposed experiments to verify process improvements must include appropriate plans to measure improvements in conversion effectiveness. A design of experiments approach to optimize process parameters will not be considered responsive to this solicitation.

Questions – contact David.Forrest@ee.doe.gov

d. Technology Transfer Opportunity: Electrochemical Recycling Electronic Constituents of Value (E-RECOV)

About 60 percent of the eight million tons of electronic waste generated annually in the U.S. ends up in landfills. This electronic waste represents a significant feedstock of valuable base, precious and rare earth metals. Current electronic waste recycling efforts are primarily focused on only precious metal recovery. Processing facilities are located overseas where unsustainable acid leaching or toxic smelting processes are used, and in many cases lack environmental and worker safety controls. There is a growing need to employ safe, cost effective processes within the U.S. to capture all valuable (and in some cases strategic) materials from electronic waste streams. Such technologies enhance the security of the American people by limiting the dependence on foreign supplies of these materials while also creating new opportunities for American manufacturing.

Researchers at Idaho National Lab have developed a novel electrochemical process to safely dissolve non-ferrous metals from electronics leading to more complete recovery of recyclable materials while requiring up to 75 percent less chemical reagent than hydrometallurgical processes of comparable scale. The E-RECOV process efficiently recovers the base metals (copper, tin, zinc and nickel) thus allowing precious metals (silver, gold and palladium) to be recovered more efficiently using industry standard methods. The E-RECOV process continuously regenerates the initial oxidizer at the anode, giving the process solution a long life, resulting in significant savings in reagents and waste treatment. The result is reduced chemical use and production of multiple value products. There are options to recover rare earth elements if the feedstock contains appropriate content.

This Technology Transfer Opportunity seeks to leverage an electrochemical process and associated novel system of reactors to recover metals from electronic waste developed at Idaho National Lab, under funding from the Critical Materials Institute. The ideal candidate for this TTO opportunity will have an expertise in sourcing specific electronic waste such as printed circuit boards, knowledge of abrasive feedstock size reduction and processing and a knowledge of implementation of hydro and ~~electrometallurgy based~~electrometallurgy-based processes. The targeted outcome will be demonstration and scale up of the process to remove metals of value from electronic waste streams.

Idaho National Laboratory Information:
Licensing Information:
License type: Exclusive or Non-Exclusive, please include description of intended field of use in proposal.
Patent Status:

- U.S. Patent No. 9,777,346
  Methods for Recovering Metals ~~From~~from Electronic Waste, and Related Methods
  Issued October 3, 2017.
- U.S. Patent Application No. 15/690,717
  Methods for Recovering Metals ~~From~~from Electronic Waste, and Related Methods
  Filed October 30, 2017.

Questions – contact jonathan.cook@inl.gov and tara.gonzalez@ee.doe.gov

Subtopic a) References:
[1] Cybersecurity ~~For~~for Manufacturers: Securing the Digitized and Connected Factory. September 2017. https://cra.org/ccc/wp-content/uploads/sites/2/2017/10/MForesight-Cybersecurity-Report.pdf

[2] Cybersecurity Framework Manufacturing Profile. NISTIR 8183, September 2017.
https://nvlpubs.nist.gov/nistpubs/ir/2017/NIST.IR.8183.pdf
[3] Guide to Industrial Control Systems (ICS) Security. NIST Special Publication 800-82, May 2015.
https://nvlpubs.nist.gov/nistpubs/specialpublications/nist.sp.800-82r2.pdf

Subtopic b) References:

[1] Cohen-Tanugi, D., and Grossman, J.C., 2015, Nanoporous Graphene as a Reverse Osmosis Membrane: Recent Insights from Theory and Simulation, Desalination, Vol. 366, p. 59-70. http://www.rle.mit.edu/gg/wp-content/uploads/2016/03/04_NanoporousGraphene.pdf
[2] Assanis, et al., 2000, Study of Using Oxygen-Enriched Combustion Air for Locomotive Diesel Engines, Journal of Engineering for Gas Turbines Power, Vol. 123, Issue 1, p. 157-166.
http://gasturbinespower.asmedigitalcollection.asme.org/article.aspx?articleid=1421153
[3] Kurunov, I.E., and Beresneva, M.P., 1999, Effect of Enriching the Blast with Oxygen on the Production Cost of Pig Iron, Metallurgist, Vol. 43, Issue 5, p. 217-220. http://link.springer.com/article/10.1007/BF02466966
[4] Ramasubramanian, K., Verweij, H., and Ho, W.S.W., 2012, Membrane processes for carbon capture from coal-fired power plant flue gas: A modeling and cost study, J. Membr. Sci., 421-2 299-310
http://www.sciencedirect.com/science/article/pii/S0376738812005789

Subtopic c) References:

[1] Forrest and Balachandran, "Carbon Covetic Nanomaterials Show Promise," Advanced Materials & Processes, v. 175, no. 6, Sept. 2017, p. 30.
https://static.asminternational.org/amp/201706/files/assets/common/downloads/AMP_DigitalEdition_September.pdf
[2] Bakir and Jasiuk, "Novel metal-carbon nanomaterials: A review on covetics," Advanced Materials Letters, v. 8, no. 9, June 2017, p. 884-890.
https://www.researchgate.net/publication/317865542_Novel_metal-carbon_nanomaterials_A_review_on_covetics
[3] Forrest, et al., "Novel Metal-Matrix Composites with Integrally-Bound Nanoscale Carbon," Nanotech 2012, Santa Clara, CA, 18 June 2012. http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA559436
[4] U.S. Patent 8647534, Copper-carbon composition, https://patents.justia.com/patent/8647534
[5] U.S. Patent 9273380, Aluminum-carbon compositions, https://patents.justia.com/patent/9273380
[6] Defense Logistics Agency strategic materials:
http://www.dla.mil/HQ/Acquisition/StrategicMaterials/Materials/

Subtopic d) References:

[1] https://factsheets.inl.gov/FactSheets/8ERECOV.pdf
[2] LA Diaz, TE Lister, JA Parkman, GG Clark - Journal of Cleaner Production, 2016 – Elsevier
https://www.sciencedirect.com/science/article/pii/S0959652616301299
[3] TE Lister, P Wang, A Anderko - Hydrometallurgy, 2014 – Elsevier
https://www.sciencedirect.com/science/article/pii/S0304386X14001820

2. BIOENERGY

Maximum Phase I Award Amount: (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Bioenergy Energy Technologies Office (BETO) has a mission to help transform the nation's renewable and abundant biomass resources into cost-competitive, high-performance biofuels, bioproducts, and biopower. BETO is focused on forming partnerships with key stakeholders to develop and demonstrate technologies for advanced biofuels production from lignocellulosic and algal biomass as well as waste resources.

All applications to this topic must:

- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP and/or state of the art products or practices);
- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Provide a path to scale up in potential Phase II follow on work;
- Fully justify all performance claims with thoughtful theoretical predictions or experimental data;
- Be based on sound scientific principles (i.e. abides by the law of thermodynamics).

Grant applications are sought in the following subtopics:

a. Cell-Free Biochemical Platforms to Optimize Biomass Carbon Conversion Efficiency

The Bioenergy Technologies Office is interested in expanding the use of cell-free systems to further upgrade cellulosic sugars, lignin compounds, and other waste streams into biofuels and bioproducts. Cell-free biosynthesis technologies are a means of utilizing biocatalysts (enzymes) to perform complicated biochemical reactions that often cannot occur with industrial inorganic catalysts.- As a historical example, cell-free systems have been used to convert cellulose into glucose for the production of ethanol [1].

Cell-free biosynthesis technologies offer unique advantages compared to conventional microbial fermentations. -These include the ability to:

- D~~to d~~irect higher fractions of carbon to product as opposed to cell maintenance thereby increasing yield [2];
- O~~to o~~bviate the risk of producing or accumulating toxic intermediates to the cell [3];
- R~~to r~~educe capital costs and increase operational throughput by implementing novel reactor designs [4];
- C~~to c~~reate *de novo* synthesis pathways by "mixing and matching" of enzymes and/or lysates from different organisms [5].

Significant challenges exist prior to these types of technologies being expanded to the applications described above. -At the recent Cell-Free Synthetic Biology and Biocatalysis Listening Day (https://www.energy.gov/eere/bioenergy/cell-free-synthetic-biology-and-biocatalysis-listening-day), participants identified several key technical barriers that need to be overcome. These technical barriers, enzyme stability, cofactor regeneration, and novel enzyme production hosts and purification strategies, make up the three areas of focus for this subtopic. Applications to this subtopic should address only one of these focus areas in their proposal.

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Area 1, Enzyme stability: Enzyme stability represents a significant technical and economic hurdle to technology development in this space. -Without enzymes or lysates that are stable on the order of weeks, significant fractions of carbon will otherwise be used in generating the biocatalysts required of these systems. -If the enzyme(s) are being scaffolded, the enzyme stability should be demonstrated in this context.

Area 2, Cofactor Regeneration: Inherent to cellular fermentations is the need to balance reducing equivalents (NADH and NADPH) which is achieved through the conversion of pyruvate to Acetyl-CoA, ferredoxin reductases, etc. -Equally important are methods to perform ~~adenosine-triphosphate~~adenosine triphosphate (ATP) replenishment in the cell-free system. -It is simply not economically feasible to supplement a cell-free system with these compounds, so they need to be sustained in-vitro. ~~(it)~~ Opgenorth [2] ~~et al. 2014~~ describes one such method of balancing these cofactors in order to have these available for subsequent enzymes.

Area 3, Novel enzyme production hosts and purification strategies: Current cell-free systems rely largely on the bulk production of enzymes using E. coli as a host. -As such, the range of enzymes and lysates is limited to those that can be successfully heterologously expressed in E. coli.

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General Requirements:

- Proposed systems must utilize cellulosic sugars, lignin, or wet waste streams as the primary feedstock to produce biofuels or bioproducts.- Proposed systems can also utilize biological intermediates as starting materials (e.g. acetate, pyruvate, butyrate, etc.).
- Applications must address the current state of the art for the production of their target biofuel or bioproduct. -At a minimum they need to identify the titer, rate, and yield.
- Product yield calculations need to account for the substrate that is used to produce the purified enzymes and/or lysate.
- By the end of Phase I, projects must have a strategy for eliminating the need for exogenous cofactors (e.g. ATP, NADH, etc.).
- Methods for enzyme purification from the original host must be considered as this can constitute significant costs.

Questions – contact david.babson@ee.doe.gov

b. Reshaping Plastic Design and Degradation

Plastics are a hallmark of modern life and consumer use of plastics is projected to grow over the coming decades, yet only about 2% of plastics like bottles are recycled into the same or similar-quality applications [1]. This subtopic will focus on two areas of R&D: Designing Plastics for a Circular Carbon Economy and Reimagining Plastic Degradation for Upcycling. Applicants should address only one of the R&D focus areas in their proposal.

Area 1: Designing Plastics for a Circular Carbon Economy
Modern plastics need to be designed and manufactured with recyclability in mind. Biobased feedstocks are well-suited for designing the plastics of the future due to their composition and structure. Unlike traditional feedstocks, which contain primarily carbon-carbon and carbon-hydrogen bonds, biobased feedstocks contain cleavable oxygen linkages which could be incorporated into the design of new plastics, essentially introducing "zippers" that allow for facile deconstruction at the end of the product's life [2]. In addition, biobased feedstocks can allow access to chemical structures which are not economical to access from petroleum,

potentially providing new avenues to access performance-advantaged materials with novel properties. The Department of Energy is seeking proposals targeting bio-derived plastics designed with end-of-life considerations in mind that can enable a circular carbon economy.

Other considerations include:

- Proposed systems must utilize bio-based feedstocks including lignocellulosic biomass, cellulosic hydrolysates, and other lignocellulose-derived intermediates. Feedstocks used for feed or food will be deemed unacceptable.
- Proposals must discuss end-of-life considerations and thoroughly explain the proposed material's advantages over petroleum derived materials. This includes methods to quantitatively characterize of the end-of-life properties of the proposed material.
- Proposals are encouraged to explore performance-advantaged plastics that in addition to superior end-of-life considerations can outperform traditional plastics for a specific, chosen application.
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Area 2: Reimagining Plastic Degradation for Upcycling

Only a small fraction of the 60 million ~~tonnes~~tons of plastic used in the United States is recycled, and an even smaller fraction is made into similar quality products as the original plastic, due to a loss in material properties during the recycling process [3]. The rest of plastic waste typically ends up in either landfills or the environment, causing ecological damage. Better methods are needed to address the large waste-disposal problem presented by currently used plastics. This topic will focus on ways to remake our current systems for plastic disposal and recycling with a focus on utilizing an array of plastics as feedstocks for value-added applications. The Department of energy is seeking proposals exploring challenges in selective C-O, C-N, and C-C chemistry, crystallinity, feedstock contamination, breakdown rate, and other innovative ideas to address difficulties with plastic degradation and upcycling. Proposals are encouraged to target systems with low energy requirements as opposed to systems like gasification which have previously been thoroughly investigated for these feedstocks [4].

Other considerations include:

- Proposed systems must target waste plastic streams including but not limited to polyethylene, polypropylene, polystyrene, polyethylene terephthalate, ~~polyurethanes~~polyurethanes, nylons, polyamides, and polylactams.
- Proposals are encouraged to target mixed or contaminated waste plastic streams with their eventual system configurations, though this is not required for Phase I.
- Proposals are encouraged to target value-added output streams, for example compounds that are more valuable than mixed polymer-derived monomer streams, though this is not required.
- Chemical and biological processes are both of interest.

Questions – contact jay.fitzgerald@ee.doe.gov

c. Algae Engineering Incubator

BETO's Advanced Algal Systems subtopic, "Algae Engineering Incubator" is intended to identify potentially impactful ideas that are not meaningfully addressed in the subprogram's project portfolio. The subtopic will be open to all applications that propose the development of technologies that facilitate the goals of the Advanced Algal Systems R&D subprogram through non-biological, engineering approaches. Applicants can

review the 2017 Peer Review [1] and 2015 Peer Review [2] reports to identify what non-biological, engineering R&D has already been funded in the portfolio.

The scope for this subtopic is intentionally broad. Examples of proposals that fit this subtopic are the development of equipment that improves laboratory experimental throughput or data quality, the creation of technologies that assist in monitoring and automation of cultivation, and the testing of new materials to reduce the capital expenses of cultivation systems.

Applicants should clearly describe how they will meet the Advanced Algal System's goals or how success of their project will facilitate the success of performers in BETO's algae portfolio.

Applications specifically **not** of interest:

- Applications that propose to conduct R&D that was the primary focus of previous funding opportunities. Examples of work supported by previous funding opportunities are:
  - Recovery of nutrients from conversion to recycle back to cultivation;
  - Development of harvest/processing technology;
  - Development, characterization, and valorization of finished biofuels and bioproducts from algal biomass;
  - Research on biological improvements, including engineering of strains and cultivation ecology;
  - Research on increasing carbon utilization efficiencies of algal cultivation as well as on developing direct air capture technologies.
- Applications that propose to develop technology that relies on purely heterotrophic algae cultivation.
- Applications that propose mixotrophic algae cultivation strategies that utilize food-based sugars (i.e., derived from food-based crops including but not limited to corn, beets, sorghum, and sugar cane).
- Applications that propose to develop technology for the artificial lighting-based cultivation of algae for energy products (other than as an enabling tool for high throughput laboratory-based screening).
- Applications that propose to work on biomass other than algae biomass (e.g. lignocellulosic biomass, non-algae microorganisms, fungi, etc.).

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Questions – contact devinn.lambert@ee.doe.gov

Subtopic a) References:

[1] National Renewable Energy Laboratory. 1993. "'Mini-Manhattan Project' for Cellulases". https://www.nrel.gov/docs/legosti/old/5676.pdf
[2] Opgenorth et al. 2014. "A synthetic biochemistry molecular purge valve module that maintains redox balance." Nat. Commun. doi: 10.1038/ncomms5113.
[3] Opgenorth et al. 2017. "A molecular rheostat maintains ATP levels to drive a synthetic biochemistry system." Nat. Chem Biology. doi: 10.1038/nchembio.2418
[4] Nussbaumer et al. 2017. "Bootstrapped biocatalysis: biofilm-derived materials as reversibly functionalizable multienzyme surfaces." ChemChem. doi.org/10.1002/cctc.201701221
[5] Dudley et al. 2016. "Cell-free mixing of Escherichia coli crude extracts to prototype and rationally engineer high-titer mevalonate synthesis." ACS Synth. Biol. DOI: 10.1021/acssynbio.6b00154

Subtopic b) References:

[1] S. Lemonick. Chemical and Engineering News. 96, 25 (2018)

[2] S. Lemonick. Chemical and Engineering News. 96, 25 (2018)
[3] J.M. García J, M.L. Robertson, M. Science. 358, 6365 (2017)
[4] A. Rahimi, J. M. García. Nat. Rev.Chem. 1, 0046 (2017).

Subtopic c) References:

[1] U.S. Department of Energy, Bioenergy Technologies Office, 2017 Project Peer Review. Retrieved September 5, 2018, from https://www.energy.gov/eere/bioenergy/peer-review-2017
[2] U.S. Department of Energy, Bioenergy Technologies Office, 2015 Project Peer Review. Retrieved September 5, 2018, from https://www.energy.gov/eere/bioenergy/peer-review-2015

3. BUILDINGS

Maximum Phase I Award Amount: (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

Residential and commercial buildings account for more than 40% of the nation's total energy demand and 70% of electricity use, resulting in an annual national energy bill totaling more than $380 billion [1, 2]. The U.S. Department of Energy's Building Technologies Office (BTO) (http://energy.gov/eere/buildings) is working in partnership with industry, academia, national laboratories, and other stakeholders to develop innovative, cost-effective energy saving technologies that could lead to a significant reduction in building energy consumption and enable sophisticated interactions between buildings and the power grid. BTO's goal is to reduce aggregate building energy use intensity by 45% by 2030, relative to the consumption of 2010 energy-efficient technologies. The rapid development of next-generation building technologies are vital to advance building systems and components that are cost-competitive in the market, to meet BTO's building energy use reduction goals, and lead to the creation of new business and industries. Moreover, by cutting the energy use of U.S. buildings by 20%, the American people could save approximately $80 billion annually on energy bills. And, money saved on energy costs flows to other sectors of the economy, which can lead to the creation of new jobs.

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for cost and/or performance improvements that are tied to clearly defined baseline and/or state of the art products or practices;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include an energy savings impact and/or impact on building-to-grid interaction as well as a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or experimental data.

Grant applications are sought in the following subtopics:

a. Next Generation Residential Air Handlers

According to ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers), an air handler, or air handling unit (AHU), is a Heating, Ventilation and Air-conditioning (HVAC) device that regulates and circulates air. BTO seeks to accelerate the development of the next generation Heating, Ventilation, Air-conditioning, and Refrigeration (HVAC&R), water heating and appliance technologies. -HVAC&R technologies consume more than half of the total energy used in U.S. residential and commercial buildings [1]. -HVAC alone is the largest energy end-use for U.S. buildings, consuming approximately 40% (15.5 Quads) of total energy in 2015. BTO has published several reports on the energy savings potential and RD&D Opportunities for both Residential and Commercial Building HVAC Systems [2]. These reports document energy efficiency improvements in residential HVAC systems but show a lack of improvement in residential AHUs which have mostly stayed the same in shape, form, utility and efficiency. These reports highlight some of the emerging technologies that could be used in future air handlers. BTO is seeking new technologies like those highlighted in the BTO reports that can radically enable a transformative change in the design, manufacturability, maintenance/service, performance, and energy savings from these next generation residential AHUs.

Today's residential air handlers used in central air conditioners and heat pumps systems typically look like large rectangular metal box and have for several decades. These air handlers physically connect to a home's ventilation system that distributes the conditioned air through the home with the responsibility of delivering comfort to its residents. These units are manufactured at a factory and final installation is done onsite by joining these components together and mating them to a building's duct system. Most residential air handlers include several major components including a blower (with an electric motor), an evaporator/condenser coil (heat exchanger) if a heat pump system, a furnace section if using natural gas to heat a home, and an evaporator coil for cooling if it is also an air conditioning system. Today these major components are optimized as independent components. A transformative change in air handler design will require that these components instead be optimized as a system.

BTO is seeking to develop the next generation of air handlers that are more than just better motor designs, but also new system configuration based on advanced computational fluid dynamics (CFD) modelling that addresses the problem holistically (e.g. relationship of fans with other subcomponents, etc.), and enables the next generation of air handlers and of residential HVAC technology overall. The focus is on innovative solutions that can reduce the energy consumption of an air handler or AHU by a minimum of 25%, enhance the overall performance of the HVAC system greater than 5% (heating and/or cooling modes), and enable potential new system configurations and heat exchanger designs. These designs and solutions also include natural gas or fuel-fired solutions.

Most of these system's energy efficiency measures utilize a seasonal energy efficiency ratio (SEER in British thermal units per Watt-hour (Btu/Wh)), and the heating seasonal performance factor (HSPF in British thermal units per Watt-hour (Btu/W-h)). For this solicitation, these metrics should be used to justify all system energy efficiency claims. Given the wide range of units and sizes in the field, the applicant is required to pick a representative unit as the baseline state-of-the-art (SOA) unit and make all efficiency and performance claims based on that representative unit. Please justify the SOA unit and why it makes sense for your claims and the rationale behind its choice. -While proposals are sought that focuses on residential air handlers, it is expected that some of these innovations could potential impact commercial AHUs as well. Applicants should capture these benefits and others if relevant.

Given the wide range of air handlers suitable for this subtopic, specific cost targets are not defined but should be cost neutral for the overall system design. However, applications should still report out the expected costs

of the proposed system configuration, providing analysis to support all claims made. Applications must clearly state how the following targets will be met:

Next Generation Residential Air Handlers Targets	
Energy Efficiency	≥ 25% decrease in the energy consumption of an air handler or AHU *and* enhance the overall energy efficiency performance of the HVAC system ≥ 5% (heating and/or cooling modes)
Physical size	≤ 10% greater than state-of-the-art designs
Required cleaning intervals, or difficulty of cleaning, to maintain as-new performance	Little to no increase as compared to state-of-the-art designs, should improve system reliability
Susceptibility to damage or corrosion or performance degradation during manufacture, assembly, transportation, installation, or use	Little to no increase as compared to state-of-the-art designs for relevant applications
First Cost, system	No increase as compared to state-of-the-art system designs

Questions – Contact: Antonio M Bouza, antonio.bouza@ee.doe.gov

b. Novel Materials and Processes for Solid-State Lighting

There are numerous fundamental advancements of materials and process that are applicable to energy saving technologies of interest to the DOE that address high priority research needs such as energy storage, critical materials usage, efficient manufacturing, etc. -Within EERE's Building Technologies Office (BTO), there are few other opportunities capable of achieving the remarkable energy saving potential promised by solid-state lighting (SSL) [1]. -Today, SSL has begun to transform the general illumination landscape in a very significant and energy efficient manner, it is believed that only about 10% of the total energy conserving potential of SSL has been realized using currently available technologies. -To achieve the goal of reducing domestic energy consumption of general illumination 50% or more through SSL, many innovative and technology breakthroughs are required in manufacturing processes, control systems, device architectures and constituent materials that are the subject focus of this subtopic [2]. Due to the tremendous breadth of the materials advancements required throughout the SSL landscape, this broad subtopic is described in three more narrow categories of novel materials needs or areas of interest. -Only proposals that address these specific materials-related opportunities will be considered here.

Inorganic Light Emitting Diode (LED) Materials:

Considerable research and materials development ~~has~~have been applied towards overcoming the well-known droop in III-Nitride Light-Emitting Diode (LED) efficiency with longer wavelengths particularly in the green and amber wavelength regimes [3]. Often referred to as the "Green-Gap", BTO has systematically advanced the basic understanding of the fundamental mechanisms that dictate efficiency and droop by sponsoring early-stage research in this area over the past decade. -The result has been a more comprehensive scientific understanding of the fundamental mechanisms but there remains a need for early-stage R&D to distill this knowledge to advance new and novel emitter materials and the processes used to efficiently and cost effectively manufacture them with reduced droop performance and spectral characteristics suited for general lighting applications.

Another area that has received investment by BTO is high-efficiency wavelength conversion materials and processes commonly referred to as downconverters. -While most materials development has been focused on

production of warm-white LEDs using existing Yttrium Aluminum Garnet (YAG)-based phosphors, other promising wavelength conversion materials and process have been developed recently including those that do not depend on critical materials such as Rare Earth Elements. -Other examples include nanocrystals [4] and quantum dots [5] made with a variety of constituent materials. -While promising, many of these candidate solutions still have challenges with poor thermal stability and non-uniform performance over long lifetimes. They also suffer from and high cost to manufacture or incorporate into device designs that are competitive and compatible with LED architectures that are widely used in high brightness lighting applications today. Thus, there remains a considerable opportunity for government sponsored research in alternative downconversion solutions that meet the quantum yield, thermal stability, spectral performance, color consistency and optical flux saturation requirements with a new and potentially simpler manufacturing process.

Organic Light Emitting Diode Materials:

Organic Light Emitting Diode (OLED) efficiency is limited by many factors that require breakthroughs in constituent materials. -Among the most significant materials and manufacturing process related needs are 1) high efficiency yet stable blue emitter materials, 2) high performance electrically conductive layers with superior visible light transmission properties, and 3) device encapsulating or integrated substrate materials. Considerable research has already been completed in each of these areas with varying levels of success [4]. Many of these new and novel materials advancements have been proven in laboratory experiments but have not met the simultaneous requirements of long lifetime, inexpensive manufacture and significant performance advancement. Innovative and novel solutions to this significant materials and process challenges are welcome in this area.

An important example of a novel materials need is conductive materials of advanced composition and design that perform multiple functions such as being highly transparent and electrically conductive. -In contemporary OLEDs, efficient operation depends on superior charge introduction into various photonic layers yet whose optical transmission at wavelengths of practical value is simultaneously very high. -These contradictory performance requirements are typically satisfied using Transparent Conducting Oxides (TCOs). -Indium Tin Oxide (ITO) possessing an In:Sn atomic ratio of about 10:1, is the most common TCO coating used to manufacture OLED anodes in generic bottom-up deposited layer device designs. -ITO is not, however, an ideal anode material for high efficiency OLEDs [4]. It has: inappropriate work function, difficulty in creating desired patterns, poor thermal stability, integration and bending on flexible substrates. -It also requires high quality Indium and must be processed at high temperatures. -All these factors limit the ~~high speed~~high-speed manufacture of integrated ITO substrates. -While considerable research towards identification of alternative materials or structures for OLED anodes has been completed to date [4], there appears to be only limited commercial success. -Therefore, in addition to proposed novel and unproven materials solutions to this challenge, advancement of known alternatives or processes are welcome in this area.

Optical Materials for High Efficiency Luminaires:

By their very definition, all high efficiency SSL technologies used in buildings must operate best within the visible portion of the electromagnetic spectrum. -This creates special encapsulation or packaging challenges for both LED and OLED designs. -At the device or light engine level, new materials and encapsulation methodologies must manage the refraction index to improve light extraction from these devices. New materials or alternative to conventional materials such as silicone composites, glass, or polymers that are both stable and inexpensive are needed. -This area includes the development of new and novel optical materials or

matrices applicable to either LEDs or OLEDs and may be intended for either internal or external extraction efficiency improvement. -Viable candidate approaches may incorporate other constituent materials such as downconverters for example, along with a proposed optical advancement that is novel or innovative.

Luminaires intended for use with SSL sources are typically designed based on their older counterparts that used a legacy lighting technology such as linear or compact fluorescent lamps. -This common practice, while being easy and inexpensive to implement, has limited the market penetration of efficient luminaires for a variety of reasons. -Arguably, the most significant is the limited availability of inexpensive, lightweight, and easy to manufacture optical materials that manage either the directional distribution of light from an LED or the diffuse light produced from an OLED better than the traditional material used with legacy lamp types. Materials that control light efficiently produced within the luminaire or to create beam profiles that are more easily and efficiently controlled are needed. -Novel materials and optical designs that meet these performance challenges at competitive manufacturing costs and complexity are sought under this subtopic. -Viable proposals to this subtopic may include integration of other functionality such as variable beam profiles, downconverters, or methods used to manufacture them.

Summary:

Irrespective of the technical approach proposed to meet one or more of the above areas of interest, all successful proposals must demonstrate that the enabling research completed under this effort will succeed in producing the predicted performance advancement and reduction of technical risk required to move to successive stages of research. -The proposed Phase I effort should be designed to retire significant technical risk and make proof of principle of the proposed approach. Phase II may continue to develop the approach but the fundamental question of penultimate price and performance of the proposed innovation should be well documented and clear in the Phase II proposal. -The primarily benefit of the research proposed under this topic must be aligned with the price and performance goals described in the SSL Research and Development Plan [2].

Questions – contact James R. Brodrick, james.brodrick@ee.doe.gov

c. Automated Point Mapping for Commercial Buildings

One of the major barriers to the implementation of advanced data analytics (e.g., automated fault detection and diagnostics or AFDD) and controls software can be the laborious and expensive process of tagging and mapping individual points that correspond to sensors, actuators, and controllers located throughout a building. This long process limits the affordability of emerging analytics engines or software applications under development for optimizing building energy management, and ultimately, BTO's programmatic energy savings performance goals achieved through innovations in sensor and control technologies [1]. These technologies also form a fundamental backbone for optimizing grid services from buildings in modernizing the grid.

The challenge is especially pronounced for large commercial buildings due to the large number of points involved. Assuming one minute for identifying and commissioning each point, for example, should require 833.3 labor hours for a building consisting of 50,000 points [2]. -Retrofit applications become even more complex due to inconsistent, mislabeled, or customized labeling of points associated with previously installed building automation systems (BAS) from different vendors, manufacturers, and installers. -Furthermore,

standardized point names do not include all metadata or descriptive information about a point (e.g., sensor placement location) necessary for mapping. -Manual assignment of semantics or meaning to distinguish points is also time-consuming and subject to error. -Standardized protocols (e.g., BACnet [3], LONWorks) to enable communications and automate the detection and identification process, consistent and harmonized naming conventions, semantic data models, and taxonomies or schema (e.g., Project Haystack [4], Building Information Models, Ontologies) are necessary and in development. -Limitations exist in terms of completeness, including the ability to capture uncertainty [5, 6]. This is being addressed through techniques to automate the conversion of data from existing buildings [7, 8], as well as the development of a schema that includes an open reference implementation standard for evaluation of its effectiveness [9, 10]. -Solutions are also being developed using machine learning to reduce the manual mapping process by automatically inferring names and data through statistical models that exploit patterns or correlations of points [11, 12, 13, 14, 15].

Leveraging these advancements, BTO is specifically interested in the development of innovative, early-stage algorithmic solutions to remaining technical issues for point identification that are not being currently addressed in the approaches described, such as identification of errors in existing/new point names, identification of physical location of points, and any other issues not mentioned above. These solutions should leverage and complement industry-driven protocols, as well as taxonomies and schema under development to the best extent possible. Algorithms developed in Phase I should include proof of concept validation that can be transitioned into a field testing and validation in Phase II that can inform development of commercialized product through follow-on private sector investment.

Questions – Contact: Marina Sofos, marina.sofos@ee.doe.gov

d. Complementing Building Energy Modeling (BEM) with Non-Energy Analyses

Whole-building energy modeling is just one type of analysis that informs building energy efficiency projects such as design, operation, green certification, and code and program development and implementation. Other types of analyses include life-cycle analysis, daylighting, indoor and outdoor environmental quality and thermal comfort, urban microclimate, cost and other project or building related financial metrics, water ~~resiliency~~use, resiliency, and others. These analyses can often leverage data that is available for ~~—~~ or produced by ~~—~~ whole-building energy analysis. Some can, in turn, inform or enhance whole-building energy analysis.

BTO is seeking proposals for methods and tools that complement whole-building energy analysis and leverages energy analysis, its inputs, outputs, or both, to drive complementary analyses or vice versa. Proposals may use open-source BTO-funded tools such as EnergyPlus and OpenStudio, but are not required to do so. Proposals may also leverage BTO-funded data repositories such as the Building Performance Database (BPD) and the Standard Energy Efficiency Platform (SEED), but are not required to do so. Where applicable, proposals are encouraged to use open data exchange schema such as BuildingSync, HPXML, and CityGML.

The expected output of a successful Phase I project is a working prototype of a new or enhanced analysis that is relevant to building projects and usable by "power users". Applicants are encouraged to identify a small group of such power users to help provide feedback and demonstrate the utility and relevance of the analysis. Successful Phase I projects should be ready to apply for either private funding or Phase II awards that will focus on scaled-up market-ready solutions.

Questions – Contact: Amir Roth, amir.roth@ee.doe.gov

e. Data Fusion for Building Energy Efficiency Projects

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Data standardization is one of many barriers to the effective implementation of energy efficiency programs and projects. Lack of standardization makes it difficult to aggregate multiple data-sets that provide similar information about different sets of buildings into a single larger set that can support more robust analysis. More significantly, it prevents "fusion" of data-sets that provide different information about the same set of buildings to create new analyses. Over the past several years, BTO has invested in a number of standards and technologies intended to address these issues, streamline existing applications, and enable new applications. Standards include the Unique Building Identifier (UBID), the BEDES data dictionary, and the BuildingSync and Home Performance XML building energy schema. Tools include the Building Performance Database (BPD), the Standard Energy Efficiency Data (SEED), and the Audit Template.

BTO is seeking proposals that leverage these open data standards, schema, platforms and repositories (as well as others such as CityGML, EnergyADE, and GreenButton) and use modern data fusion and science techniques to develop new and enhanced analytical capabilities that lower barriers to engagement and transaction costs of energy-efficiency projects at the scale of individual buildings or entire building stocks. Examples applications include but are not limited to: 1) energy-efficiency services for building operators, tenants, and large-portfolio owners, 2) energy efficiency program development and implementation; 3) effectiveness and impact assessment of new technologies and operational strategies. In addition to energy-efficiency, proposals may also address areas that are of more recent interest to BTO, including demand reduction, demand flexibility and the ability of buildings to provide grid services, critical water issues, and resiliency.

The expected output of a successful Phase I project is a working prototype of a new or enhanced analysis that is relevant to building projects and usable by "power users". Applicants are encouraged to identify a small group of such power users to help provide feedback and demonstrate the utility and relevance of the analysis. Successful Phase I projects should be ready to apply for either private funding or Phase II awards that will focus on scaled-up market-ready solutions.

Questions – Contact: Amir Roth, amir.roth@ee.doe.gov

References:

[1] U.S. Energy Information Administration. Natural Gas Summary from 2012 – 2017. Washington, DC: U.S. Department of Energy, Release date: July 31, 2018. Accessed August 30, 2018: https://www.eia.gov/dnav/ng/ng_sum_lsum_dcu_nus_a.htm

[2] U.S. Energy Information Administration. Electric Power Monthly with Data for December 2016. Washington, DC: U.S. Department of Energy, February 2017. https://www.eia.gov/electricity/monthly/archive/february2017.pdf

Subtopic a) References:

[1] U.S. Energy Information Administration. Annual Energy Outlook 2014 with Projections to 2040. DOE/EIA-0383(2014). Washington, DC: U.S. Energy Information Administration, 2014.

[2] http://www1.eere.energy.gov/buildings/pdfs/residential_hvac_research_opportunities.pdf & http://www1.eere.energy.gov/buildings/pdfs/commercial_hvac_research_opportunities.pdf

Subtopic b) References:

[1] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2017, SSL Forecast Report, (https://www.energy.gov/eere/ssl/ssl-forecast-report)
[2] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Solid-State Lighting 2017 Research & Development Plan, (https://www.energy.gov/eere/ssl/downloads/solid-state-lighting-2017-rd-plan-suggested-research-topics)
[3] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2018, LED R&D Projects (https://www.energy.gov/eere/ssl/listings/led-rd-projects) and OLED R&D Projects (https://www.energy.gov/eere/ssl/listings/oled-rd-projects)
[4] Y. Shirasaki et al., "Emergence of colloidal quantum-dot light-emitting technologies," Nature Photonics 7, 13 (2013).
[5] Palomaki, Peter, "Quantum Dot Downconverters for SSL", DOE SSL R&D Workshop January 29-31, 2018, Nashville, TN, https://www.energy.gov/sites/prod/files/2018/02/f48/palomaki_qd-downconverters_nashville18_0.pdf

Subtopic c) References:

[1] Sofos, M., Langevin, J.T. (2018). Laying Down the Foundation: An R&D Roadmap for Energy Savings through Advancements in Smart Buildings Technologies," 2018 ACEEE Summer Study on Energy Efficiency in Buildings.
[2] Park, Y. (2012). Point Naming Standards: A Necessary Evil for Building Information Integration. ISA Automation Week: Control Performance, pp. 37-49. International Society of Automation, Research Triangle Park, NC.
[3] http://www.bacnet.org
[4] https://project-haystack.org
[5] Bhattacharya, A. A., Ploennigs, J., Culler, D. (2015). "Short Paper: Analyzing Metadata Schemas for Buildings – The Good, ~~The~~the Bad, and the Ugly," BuildSys '15.
[6] Schumann, A. et al., (2014). "Toward Automating the Deployment of Energy Savings Approaches in Buildings," BuildSys.
[7] Balaji, B., ~~et.al.,~~et.al, (2015). "Organizing large deployment of sensors to create reusable applications for buildings," BuildSys '15, 13-22.
[8] Bhattacharya, A. A., Hong, D., Culler, D., Ortiz, J., Whitehouse, K., Wu, E. (2015). "Automated metadata construction to support portable building applications." BuildSys '15, 3-12.
[9] http://brickschema.org
[10] Balaji, B., et al., (2016). "Brick: Towards a Unified Metadata Schema ~~For~~for Buildings," BuildSys '16.
[11] Schumann, A. et al., (2014). "Toward Automating the Deployment of Energy Savings Approaches in Buildings," BuildSys.
[12] Hong, D., Wang, H., Ortiz, J., Whitehouse, K., (2015). "The building adapter: Towards quickly applying building analytics at scale." BuildSys '15, 123-132.

[13] Ortiz, J., Dezhi, H., Whitehouse, K., Culler, D. (2013). "Towards automatic spatial verification of sensor placement in buildings," Proceedings ~~foof~~ the 5th ACM Workshop on Embedded Systems for Energy-Efficient Buildings.
[14] Koc, M., Akinci, B., Berges, M. (2014). "Comparison of linear correlation and statistical dependency measure for inferring spatial relation of temperature sensors in buildings," BuildSys '14.
[15] Gao, J., Ploennings, J., Berges, M. (2015). "A data-driven meta-data inference framework for building automation systems." BuildSys '15, 23-32.

4. FUEL CELLS

Maximum Phase I Award Amount: (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Fuel Cell Technologies Office (FCTO)~~[]~~ [1] is a key component of the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) portfolio. The central mission of FCTO is to stimulate the U.S. economy and global competitiveness by reducing dependence on foreign oil imports and establishing a domestic power and fuel industry using efficient, reliable clean energy technologies through early stage research and technology development. To achieve this goal, FCTO invests in early-stage, innovative technologies that show promise in harnessing American energy resources safely and efficiently. Fuel cells can address our critical energy challenges in all sectors - commercial, residential, industrial, and transportation.

Fuel cell electric vehicles (FCEVs) using hydrogen can achieve significantly higher efficiencies than combustion engines resulting in overall less energy use. Hydrogen can be produced from diverse domestic resources, such as natural gas, oil, coal, and biomass, as well as from renewables using methods such as direct or indirect water splitting. In addition to transportation applications, hydrogen and fuel cell technologies can also serve stationary application ~~s~~ i.e. providing responsive back-up power and other electric and fuel distribution services improving energy security and reliability. Thus, fuel cell and hydrogen technologies enable American energy dominance by safely and efficiently harnessing domestic resources.

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FCTO addresses key technical challenges for both fuel cells and hydrogen fuels (i.e., hydrogen production, delivery and storage). Light duty FCEVs are an emerging application for fuel cells that has earned substantial commercial and government interest worldwide due to the superior efficiencies, reductions in petroleum consumption, and reductions in criteria pollutants possible with fuel cells. Recent analyses project that, if DOE cost targets for FCEVs are met, U.S. petroleum consumption can be reduced by over one million barrels per day~~3~~. FCEVs reduce petroleum consumption by about 95% in comparison to conventional light duty vehicles when the hydrogen is produced from natural ~~gas~~gas [2]. The areas identified in this topic will enable progress toward commercializing light duty FCEVs.

Grant applications are sought in the following subtopics. Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);

- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

a. Fuel Cell Membranes and Ionomers

Polymer electrolyte membrane (PEM) fuel cells are a leading candidate to power zero emission vehicles, with several major automakers already in the early stages of commercializing fuel cell vehicles powered by PEM fuel cells. PEM fuel cells are also of interest for stationary power applications, including primary power, backup power, and combined heat and power. Commercial PEM technology typically is based on perfluorosulfonic acid (PFSA) ionomers, but these ionomer materials are expensive, particularly at the low volumes that will be needed for initial commercialization. Non-PFSA PEMs, including those based on hydrocarbon membranes, represent a lower-cost alternative, but government sponsored R&D is needed to improve non-PFSA's relatively low performance and durability.

Development of novel hydrocarbon and other ionomers, including non-PFSA PEMs suitable for application in fuel cells is solicited through this subtopic. Novel PEMs developed through this subtopic should have all properties and characteristics required for application in PEM fuel cells for transportation applications, including:

- High proton conductivity in a range of temperature and humidity conditions;
- Good film forming properties enabling formation of thin (<10 μm) uniform membranes;
- Low swelling and low solubility in liquid water;
- Low creep under a range of stress, temperature, and humidity conditions;
- Low permeability to gases including H2, O2, and N2;
- Chemical and mechanical durability sufficient to pass the accelerated stress tests.

The goal of any proposed work under this subtopic should be to produce a PEM using an affordable and durable ionomer that can meet or exceed all of the 2020 technical targets simultaneously in the table below. PEM technology proposed for this subtopic should be based on non-PFSA ionomers, but may include reinforcements or other additives.

Membrane samples should be tested at an independent laboratory at the end of each phase. Phase I should include measurement of chemical and physical properties to demonstrate feasibility of concurrently meeting or exceeding the targets below related to these parameters, while Phase II should address long term durability and development of manufacturing processes to meet the cost targets.

Technical Targets: Fuel Cell Membranes for Transportation Applications Excerpted from [1]

Characteristic	Units	2020 Targets
Maximum oxygen crossover	mA / cm^2	2
Maximum hydrogen crossover	mA / cm^2	2

Area specific proton resistance at:		
Maximum operating temperature and water partial pressures from 40–80 kPa	Ohm cm²	0.02
80°C and water partial pressures from 25–45 kPa	Ohm cm²	0.02
30°C and water partial pressures up to 4 kPa	Ohm cm²	0.03
-20°C	Ohm cm²	0.2
Maximum operating temperature	°C	120
Minimum electrical resistance	Ohm cm²	1,000
Cost[d]	$ / m²	20
Durability		
Mechanical	Cycles until >15 mA/cm² H_2 crossover	20,000
Chemical	Hours until >15 mA/cm² crossover or >20% loss in OCV	>500
Combined chemical/mechanical	Cycles until >15 mA/cm² crossover or >20% loss in OCV	20,000

Questions – Contact: Donna Ho, Donna.Ho@ee.doe.gov

b. Nozzles for High-Pressure, Low-temperature Gas Fills

The cost and reliability of nozzles for dispensing of hydrogen into light duty fuel cell vehicles is currently a critical barrier to the viability of hydrogen infrastructure. Hydrogen dispensers currently account for 35% of unscheduled maintenance events at stations, and design flaws are one of the most common causes of nozzles losing functionality [1]. —Innovations in manufacturing techniques for nozzles could reduce their capital costs, improve the reliability of fueling stations, reduce leakage of hydrogen, and ensure domestic leadership in the emerging area of hydrogen infrastructure. -Domestic stakeholders in related industries, such as suppliers of compressed natural gas (CNG) components, may be particularly well-positioned to leverage existing technologies in R&D on hydrogen fueling.

Proposals are sought for the development of hydrogen fueling nozzles for use at high-throughput stations (80% utilization) for light-duty vehicles, using filling methods compliant with the Society of Automotive Engineers (SAE) J2601 fueling protocol [2]. -Nozzles should be capable of incorporating station-to-vehicle communications technologies that are currently in use (e.g. infrared communication between the vehicle and the fueling station), or being considered for use in future stations (e.g. wireless communication). Phase I of the proposed work may include evaluation of advanced materials, manufacturing techniques (e.g. additive manufacturing), or designs for nozzles, along with down-selection of one concept for further evaluation. Phase II may include development of a nozzle prototype, experimental verification of prototype performance, and techno-economic analysis of nozzle cost. Nozzle concepts proposed must target~~be capable of~~: 1)

hydrogen fills per flow rates, temperatures, and pressures specified in the SAE J2061 protocol, 2) a service life of at least 25,550 fills/year for 10 years, and 3) a capital cost of $7,000 or less for nozzles, not including the cost of communications components.

Questions – Contact: Neha Rustagi, Neha.Rustagi@ee.doe.gov

c. Active Low Cost Thin Film Hydrogen Sensors

Hydrogen gas is used in a variety of sectors today (e.g. oil refining, coal power plants, fueling stations for fuel cell vehicles), and safe operation requires the ability to rapidly detect and contain leaks. -Approaches currently used for leak detection include monitoring of drops in pressure, along with use of thin films with chemical indicators that change color in the presence of hydrogen. -While current technologies can detect leaks from point sources (e.g. due to fittings or failure of seals), most cannot also autonomously communicate, in rapid dynamic response times, with a facility to notify its operator of the leak. -Additionally, their performance is challenged in outdoor environments, where heightened sensitivity is required due to the potential for hydrogen to diffuse widely.

This subtopic seeks R&D on enabling viable leak detection technologies including integration with communications technologies that notify a system operator when a leak occurs. -Phase I funding is for proof-of-concept R&D and testing of communications concepts (e.g. radio frequency identification distributed networks) that may be integrated with existing leak detectors. -Phase II funding would enhance the sensitivity of the leak detection technologies to improve their performance in outdoor environments while meeting affordability targets. -Concepts proposed should be resilient when exposed to high concentrations of hydrogen, compatible with a large assortment of operating systems, ~~and capable~~and capable of communication with a facility within sub seconds.

Questions – Contact: Laura Hill, Laura.hill@ee.doe.gov

d. Smart Sensors for Structural Health Monitoring (SHM) of Composite Overwrapped Pressure Vessels (COPVs) of On-board Hydrogen Storage for Fuel Cell Electric Vehicles (FCEVs)

Fuel Cell Electric Vehicles (FCEVs) are now commercially available in certain parts of the U.S. and around the world with many meeting the initial DOE goal of a 300 mile driving range using carbon fiber composite overwrapped pressure vessels (COPV) rated for 700 bar compressed hydrogen service. [1] In addition, there are now approximately 35 retail hydrogen refueling stations open to the public in California with several more expected to come online soon~~.~~[. [2]

To harness American energy resources safely and efficiently and to improve the safety of the high-pressure COPVs, there is interest in developing health monitoring sensors that can provide real-time indication of potential damage or degradation of the composite overwraps. Real-time sensors could also eventually lead to reduction in the manufacturing overdesign of the COPVs and thus lower overall cost. Damage to the composite overwraps can result from pressure loads over time, environmental induced degradation in operation, and accidental mechanical impacts. COPVs can be subjected to a broad range of damage mechanisms, either usual (e.g., cycling) or accidental (e.g., car accident, fall or impact during transport, handling, installation, etc.). Potential damage mechanisms can include fiber breakage, delamination and matrix cracking. R&D is needed to improve characterization of COPV damage resulting from a mechanical

impact (e.g. from a projectile or drop), its evolution under typical in-service loadings (monotonic pressurization, filling/emptying cycles, etc.), and the corresponding loss of performance. This is partially due to there being only a few studies addressing the consequence of impact on the residual lifetime of composite materials obtained by filament winding. In addition a surface impact could create damage in the thickness of the composite and can even damage the liner. [3] Such sensors could also be utilized for COPVs used in other applications, such as onboard compressed natural gas (CNG) vehicles and self-contained breathing apparatuses (SCBA) used by first responders.

To ensure of the structural health of the COPVs to prevent unexpected failure, online monitoring of the tank would be of value. Applications are sought to perform early stage research, development and demonstration (RD&D) of techniques/instruments/technologies that can monitor vital aspect of COPVs. The monitoring needs to be imbedded/integrated into the COPV and can monitor COPV features passive or actively.

Some potential areas of interests include, but are not limited to:

- Non-Destructive Evaluation (NDE) techniques for continuously monitoring structural health for improved fatigue life, stress rupture, and damage tolerance.
- Gauges for sensing and recording/reporting abnormalities in stress, strain, localized pressure and temperature rise, cycle counting, and scheduled maintenance.
- Sensors for detecting permeation, leakage, pressure decay, humidity, and localized heat transfer.
- Massive data collection effort through network connected SHM sensors to drive reduction in statutory overdesign (e.g. reduce safety factor and/or necessary manufacturing overdesign).

Questions – Contact: Bahman Habibzadeh, bahman.habibzadeh@ee.doe.gov

e. Innovative Concepts for Hydrogen Conversion to Liquid Hydrocarbon Fuels

Applications are sought for innovative catalyst and reactor designs for synthesis of liquid hydrocarbons from captured CO2 and hydrogen produced from renewable energy sources.

One promising pathway for utilization of stranded renewable energy resources is synthesis of renewable liquid hydrocarbon fuels from captured CO2 and H2 produced through water splitting utilizing renewable energy. These liquid hydrocarbons are compatible with the existing fuel infrastructure and can provide means for inexpensive transportation, storage, and distribution of renewable energy, ultimately creating a sustainable carbon cycle for energy production and utilization.

Several commercial processes can produce liquid hydrocarbons from coal or natural gas, (e.g. Fischer-Tropsch, Methanol, DME synthesis) by first converting the fuel into syngas (a mixture of CO and H2) followed by liquid hydrocarbon synthesis step. Presently, these processes are generally carried out in large scale reactors under continuous operating conditions. Several important modifications to the existing processes will need to be implemented in order to make them compatible with liquid hydrocarbon production from captured CO2 and renewable H2 and adapted to utilizing renewable energy sources.

Firstly, the processes and catalysts have to be modified to operate with CO2 instead of CO in the feed. Conversion of CO2 into CO in a reverse Water-Gas-Shift (RWGS) process is one option. Direct synthesis from CO2 and H2 is another, more direct approach. Secondly, the hydrocarbon synthesis processes have to be adapted to operation with inherently intermittent and distributed renewable energy sources, such as wind or

solar. This will require operating smaller production units that are capable of frequent start/stop and production ramping up and down [1,~~2,3~~, 2, 3].

Questions – Contact: Eric Miller, eric.miller@ee.doe.gov

General References:

[1] Fuel Cell Technologies Office (FCTO) http://energy.gov/eere/fuelcells/fuel-cell-technologies-office
[2] Nguyen, T. and Ward, J., 2016, Life-Cycle Greenhouse Gas Emissions and Petroleum Use for Current Cars, U.S. Department of Energy, Fuel Cell Technologies Office, p. 5.
https://www.hydrogen.energy.gov/pdfs/16004_life-cycle_ghg_oil_use_cars.pdf
[3] Andress, D., Nguyen, T., and Morrison, G., 2016, GHG Emissions and Petroleum Use Reduction from Fuel Cell Deployments, U.S. Department of Energy, Fuel Cell Technologies Office, p. 8.
https://www.hydrogen.energy.gov/pdfs/16003_ghg_emissions_oil_use_reduction_from_fc.pdf

Subtopic a) References:

[1] Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan (Section 3.4 Fuel Cells): https://www.energy.gov/eere/fuelcells/downloads/fuel-cell-technologies-office-multi-year-research-development-and-22 Pages 3.4-20, 48, 49, and 50

Subtopic b) References:

[1] Sprick, S. et al (2018). "Next Generation Hydrogen Station Composite Data Products: All Stations (Retail and Non-Retail Combined)—Data through Quarter 4 of 2017." https://www.nrel.gov/docs/fy18osti/71644.pdf.
[2] https://www.sae.org/standards/content/j2601_201612/.

Subtopic d) References:

[1] http://www.fueleconomy.gov/feg/fcv_sbs.shtml
[2] http://cafcp.org/stationmap
[3] https://www.hysafe.info/wp-content/uploads/2017_papers/293.pdf

5. GEOTHERMAL

Maximum Phase I Award Amount: (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

Geothermal energy is secure, reliable, flexible, and constant. It continues to be one of America's best choices for low-cost renewable energy in power generation and in direct-use applications for heating and cooling of American homes and businesses. The Geothermal Technologies Office (GTO) focuses on applied research, development, and innovations that will improve the competitiveness of geothermal energy and support the continued expansion of the geothermal industry across the U.S. [1]. Currently, the U.S. has 3.8 gigawatts electric (GWe) of installed geothermal capacity, while advances in technologies such as Enhanced Geothermal Systems (EGS) could enable access and deployment of more than 100 GWe of new geothermal capacity. Consistent with the administration's R&D priority in American Energy Dominance, this topic seeks to invest in early-stage, innovative technologies that show promise in harnessing new domestic geothermal resources that provide clean, affordable, and reliable energy. Because deploying additional baseload geothermal energy will

contribute to grid reliability and resilience as well as national security, this topic supports the Acting Assistant Secretary for EERE's grid integration priority.

A Phase I application should focus on proof of concept and bench scale testing that are scalable to a subsequent Phase II prototype development. Applications must be responsive to the following subtopice.; Aany application outside of this area will not be considered.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopic:

a. Improved downhole telemetry for geothermal drilling

In this topic, GTO solicits innovative research and development projects to enable improved downhole telemetry for geothermal drilling operations. Drilling operations can be up to 50% of the cost of the development for a geothermal project [2]. Improving downhole telemetry during drilling can reducing drilling costs and risks that would help spur the geothermal industry to expand capacity in the near-term. The International Association of Drilling Contractors defines downhole telemetry as "Signals transmitted in real-time (while drilling) from an instrument located near the bottom of the drill string to a receiving monitor on the surface (a surface-readout)" [3]. Enabling real-time data transfer from tools and sensors in the bottom-hole assembly (BHA) to the drill operator can lead to improved rates of penetration (ROP), reduced non-drilling time (NDT), and increased safety through real-time wellbore stability monitoring. Additionally, a better understanding of well depth and location and increased control for directional drilling could lead to reduced operational and stimulation costs. Current practices for downhole telemetry include wireline embedded within the drill-pipe, electromagnetic (EM) signals passed through the formation, acoustic signals carried over the drill-pipe, and sonic signals carried the drilling fluid or "mud pulse." Of these options, wireline telemetry is often not feasible and mud pulse, acoustic, and EM have limitations on bit transmission rates and data quality [4]. Additionally, geothermal wells can be drilled without a drilling fluid (called "air drilling"), which eliminates the option of mud pulse telemetry. This topic is seeking innovations that go beyond these current practices seeking to improving bit transmission rate, reducing signal attenuation, and/or reducing costs by at least 25% over current state-of-the-art. Responses to this topic must address downhole telemetry issues specific to geothermal drilling, which can include, but are not limited to: higher temperatures (>250°C), drilling through crystalline formations with little to no porosity, and air drilling.

While the high temperatures in geothermal wells often cause issues with standard electronics associated with downhole telemetry, this topic is not seeking innovations solely into new high-temperature electronics. Novel wide-bandgap semiconductors may only be proposed as a component to an otherwise innovative downhole telemetry system, not as the proposed innovation.

This topic is solely focused on downhole telemetry during geothermal drilling operations; innovation into other types of telemetry (such as long term well monitoring, fiber optic cables embedded in wellbores, etc.) will be deemed not responsive.

Questions – contact joshua.mengers@ee.doe.gov

References:

[1] Geothermal Technologies Office Website: https://energy.gov/eere/geothermal
[2] Tester et al., 2006, "The Future of Geothermal Energy, Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century"
https://www1.eere.energy.gov/geothermal/pdfs/future_geo_energy.pdf
[3] http://drillingmatters.iadc.org/glossary/downhole-telemetry/
[4] Almeida Jr. et al., 2015 "a Review of Telemetry Data Transmission in Unconventional Petroleum Environments Focused on Information Density and Reliability"
https://file.scirp.org/pdf/JSEA_2015090414401392.pdf

6. SOLAR

Maximum Phase I Award Amount: (b) (5)	$200,000	**Maximum Phase II Award Amount** (b) (5)	1,100,000
Accepting SBIR Phase I Applications: YES		**Accepting STTR Phase I Applications:** YES	

The Solar Energy Technologies Office (SETO)[1] is the primary office within the U.S. Department of Energy (DOE) that funds innovations in solar power. The office is housed within the Office of Energy Efficiency and Renewable Energy (EERE). SETO supports early-stage research and development to improve the affordability, reliability, and performance of solar technologies on the grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use and storage of solar energy, and lower solar electricity costs.

In September 2017 the office announced that its goal to make solar electricity costs competitive with other generation sources by 2020, without subsidies, had been met three years ahead of schedule for utility-scale photovoltaic solar systems [2]. The office will continue to work to lower the cost of solar (photovoltaics and concentrated solar power) energy and has established a goal to halve the cost of solar energy by 2030 [3]. With the dramatic reduction in the cost of solar, installations have soared, creating new challenges and opportunities for the electricity grid. To account for these changing needs, the office is also focusing on solar energy research and development efforts that help address the nation's critical energy challenges: grid reliability, resilience, and affordability.

Within this Funding Opportunity Announcement, SETO is releasing this Topic and joining the EERE Advanced Manufacturing Office in releasing Joint Topic 10 on "Innovation in solar module manufacturing processes and technologies."

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical and business milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are referenced to a benchmark;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

In this Topic, SETO seeks applications for the development of innovative and impactful technologies in the subtopics of:

a. TECHNOLOGY TRANSFER OPPORTUNITY: Real-Time Series Resistance Monitoring in Photovoltaic Systems

Sun Open Circuit Voltage (Suns-Voc) analysis provides a method to probe the hypothetical, series-resistance free, current-voltage (I-V) curve of a photovoltaic device.- While historically Suns-Voc has been used for the analysis of photovoltaic cells under controlled laboratory conditions, recent work at NREL has extended the Suns-Voc methodology to develop automated Real-Time Series Resistance ("RTSR") monitoring capabilities for photovoltaic modules in the field. NREL's RTSR methodology is useful to passively detect common failure modes found in installed modules, including broken ribbons, failed solder bonds, or improperly joined junction/combiner box connections in modules and systems all under normal outdoor operation, by analysis of current and voltage information taken from the inverter. –Early detection of these failure modes is critical for solar O&M providers in order to reduce potential fire risk, as well as to identify degraded, improperly installed, or otherwise underperforming modules in need of replacement. -NREL is currently looking for partners to develop hardware and software related to the improved Suns-Voc techniques for commercial applications.

National Renewable Energy Laboratory Information:
Licensing Information: National Renewable Energy Laboratory
Contact: Bill Hadley; bill.hadley@nrel.gov; (303) 275 3015
License type: Non-Exclusive
Patent Status: U.S. Patent Application Serial No. 15/564,357
Publication date:
Filing date:
http://appft1.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PG01&p=1&u=/netahtml/PTO/srchnum.html&r=1&f=G&l=50&s1=20180131322.PGNR.

Questions – contact solar.sbir@ee.doe.gov

b. TECHNOLOGY TRANSFER OPPORTUNITY: PV module Soiling Spectral Deposition Detector

Accumulation of dust, particles, and dirt on the surface of photovoltaic modules can cause a reduction in the intensity of light transmitted through the module cover and therefore in the amount of energy generated. Recent studies have shown that total power losses in Europe and the U.S. approach 7% annually due to soiling and are much worse (up to 70%) in other parts of the world. -This has significant impact on the solar market; a

flat 4% soiling loss affecting all PV capacity worldwide has been estimated to result in potentially over $1 Billion in lost revenue annually. -While PV modules can be cleaned, the one-time cost for doing so is quite expensive: -between $0.20-0.50 per module (or $5,000 for a 10 MW system). -Thus, it is important to monitor soiling in order to plan for the most accurate cleaning schedule of a system; while uncleaned modules result in unnecessary revenue loss due to diminished energy generation, the cost of cleaning modules can be prohibitively expensive if ineffectively performed. -There exists a need to determine the exact level of soiling present in an installed PV system so as to make educated decisions about when cleaning of the system is required. NREL has developed a prototype device which can detect the amount of soiling present throughout an installed PV system and correlate that soiling level with lost power generation. -In this way, informed decisions about how and when to clean installed modules can be made. -NREL is currently looking for a partner to perform continued field-tests and optimization of the device in various real-world scenarios, environments, and weather conditions.

National Renewable Energy Laboratory Information:
Licensing Information: National Renewable Energy Laboratory
Contact: Bill Hadley; bill.hadley@nrel.gov; (303) 275 3015
License type: Non-Exclusive
Patent Status: U.S. Patent Application Serial Nos. 62/652,955 & 62/690,086
Publication date:
Filing date:

Questions – contact solar.sbir@ee.doe.gov

c. Storage technologies to enable low-cost dispatchable solar photovoltaic generation

One of the priorities of the SETO office is to support early-stage, innovative solar technologies that show promise in harnessing American energy resources safely and efficiently. In this topic, we are interested in exploring approaches that can provide opportunities for energy storage that is well suited to integration with solar photovoltaic technology, or optimizing energy use. SETO plans include collaboration with the U.S. Department of Energy's Office of Electricity [1] to select and manage awards under this subtopic.

As solar electricity costs continue to decrease, the percentage of solar photovoltaic generation (both from distributed and utility-scale systems) in the U.S. increases. This opens up new challenges and opportunities for the development of novel technologies that can enable low-cost dispatchable solar PV generation that enables increased integration and operation flexibility and allow solar electricity to be better matched to demand.

In this subtopic, SETO is seeking innovative storage technologies that could be co-located with solar photovoltaic systems and are fully compatible with the characteristics of the typical output of a solar inverter (medium-low voltage, variable generation). Technologies proposed should leverage attributes specific to solar photovoltaic generation technologies while addressing current integration gaps and challenges. SETO is especially interested in novel thermal, mechanical or chemical storage technologies that can demonstrate clear non-incremental differentiation from the current state of the art.

Applications must include a basic cost-model analysis showing a path to be cost-competitive with current state of the art, and with the potential to increase the utilization of solar photovoltaic generation in the grid.

Storage functionalities at any time scale will be considered (minutes, hours, days, seasonal). ~~However, t~~The application should clearly discuss which energy value stream this technology will target, if successful.

Applications will be considered ~~non-responsive~~non-responsive and declined without external merit review if they describe a software-only solution or a solution based on existing battery technologies or if the technology is aimed at self-consumption optimization or the application does not demonstrate a clear innovation compared to current the state of the art.

Questions – contact solar.sbir@ee.doe.gov

d. Hardened solar system design and operation for recovery from extreme events

One of the priorities of the SETO office is to enhance the ability of solar energy technologies to contribute to grid reliability and resilience as well as national security, including but not limited to security and resilience of the Nation and its critical infrastructure.

Infrastructure systems, including the electrical grid and solar generation assets (both photovoltaic and concentrating solar power) are vulnerable to extreme weather and other disruptive events. Increased asset resilience presents opportunities to maximize operability, energy availability (along with communications, water, etc.~~r...~~), and to minimize restoration costs following these occurrences.

In this subtopic, SETO is seeking innovative proposals to improve the ability of solar assets and systems to quickly recover in response to extreme events. Proposals may address specific component or system designs that passively (such as more structurally robust designs or configurations) or actively (such as array/tracker stow strategies or "hardened" components) improve survival and/or recovery time and minimize cost associated with extreme events.

Applications must include a basic cost-model analysis showing the cost/benefit of the proposed solution in comparison to current state of the art. Applications should also identify a possible case use by defining the time to recover the system fully functionalities, and provide substantiated estimates for the capabilities of the proposed approach.

Targets and metrics for hardened solar system performance could include (but are not limited to):

- Percent of system operable after extreme event (applications should specify type and intensity);
- ~~.~~Survivability at extreme wind loads (> 125 mph) is of particular interest;
- Time to full system operability after extreme event (restoration time);
- Reduction in system restoration cost following extreme event;
- Level of functionality without grid support following extreme event (islanding).

Applications will be considered ~~non-responsive~~non-responsive and declined without external merit review if~~:~~ the application does not demonstrate clear innovation compared to current the state of the art, particularly in regard to microgrid and/or islanding behaviors.

Questions – contact solar.sbir@ee.doe.gov

e. Rural solar

One of the goals of the SBIR/STTR programs is to encourage the participation of socially and economically disadvantaged persons in technology innovation with increasing geographic diversity of grant funding.

Small and medium-scale (non-utility) solar systems are mostly deployed in urban residential or commercial and industrial settings (we will refer to them as traditional locations within this subtopic). In this subtopic, SETO is seeking the development of solar photovoltaic products or system designs to enable and increase use of non-traditional installation locations when deploying small and medium-scale solar photovoltaic technologies. Such technological solutions could enable rural or economically challenged home or business owners, as well as small land holders to participate in the American solar economy and receive the associated ~~benefits~~[benefits [1]. Proposed solutions should provide particular attention to safety. In addition, solutions should be designed for flexible deployment on a variety of terrains or building types. SETO is particularly interested in technology innovation that would enable installation of solar systems on agricultural or multiuse land, including solutions that allow for complementary land use ~~//~~ value streams in a synergistic manner.

Applications should always identify possible use-case(s) and provide substantiated estimates for the capabilities of their proposed system or technology. In addition, the Applications should demonstrate that the proposed technology is cost competitive (compared to other sources of electricity) in these non-traditional locations. In their commercialization plans, Applicants should include their strategy to enter new and potentially difficult markets outside of the areas that have seen significant solar deployments over the past 10 years.

Applications will be considered ~~non-responsive~~non-responsive and declined without external merit review if within one of these areas:

- ~~-~~Undifferentiated products, incremental advances or duplicative products;
  13.
- ~~-~~Applications focusing exclusively on HVAC or water heating applications;
  14.
- ~~-~~Products or solutions for systems which do not tie to the electric grid (i.e. wholly off-grid applications, portable power, solar fuel);
  15.
- Software-only solutions.

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Questions – contact solar.sbir@ee.doe.gov

f. Affordability, reliability, and performance of solar technologies on the grid

Fueling America's energy portfolio requires access to domestic sources of clean, affordable, and reliable energy. Unleashing these abundant energy resources will require investment in next-generation energy technologies to efficiently convert them into useful energy services.

In 2017, solar power generated almost 1.5% of the total annual electricity supply in the United States, and the Energy Information Administration projects that solar will grow to 5% of U.S. electricity by 2030 [1]. Further, if the price of solar electricity and/or energy storage declines more rapidly than projected, that percentage could be even higher. But solar is more than just a source of affordable electricity; it also provides the

potential to improve grid reliability and resilience, increase employment, create business opportunities, increase energy diversity, expand domestic manufacturing, and provide environmental benefits.

In this subtopic, SETO is seeking integrated solutions that can advance solar energy technologies by lowering ~~cost~~[cost [2] while facilitating the secure integration into the nation's energy grid. Applications should fall within one of these areas:

- Advanced Solar Systems Integration Technologies: responsive applications would advance the prediction, monitoring, and control of solar power production and distribution and the capabilities of solar power electronics;
- Concentrating Solar Thermal Power technologies: responsive applications would develop technologies that focus sunlight to generate and store high-temperature heat for electricity generation and other end uses;
- Photovoltaic technologies: responsive applications would improve photovoltaic system reliability, annual energy yield, reduce supply-chain capital expense, demonstrate performance of novel photovoltaic materials and components, and develop new photovoltaic materials.

SETO is particularly interested in applications developing:

- Technologies which can reduce the manufacturing costs of solar energy system components or sub-components to boost domestic energy manufacturing and increase U.S. manufacturing competiveness;
- Technologies which enhance the ability of solar energy systems to contribute to grid reliability, resiliency and security;
- Development and publication of replicable system designs for configurations that could be installed across comparable sites (e.g. homes or commercial buildings with similar roofing)
- Designs for photovoltaic modules and system configurations that anticipate updates in codes or safety requirements;
- Technologies to improve recyclability of photovoltaic materials and components;
- Technologies / solutions that reduce the balance of system component of the cost of a photovoltaic system.

Applications must include a clear assessment of the state of the art and how the proposed technology would represent a significant improvement, along with a basic cost-model analysis showing a path to becoming cost-competitive with current state of the art and the potential to increase the utilization of solar generation in the grid.

Applications will be considered ~~non-responsive~~non-responsive and declined without external merit review if within one of these areas:

- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics);
- Applications that fall in any of the other subtopics listed in this funding opportunity announcement;
- Business plans or proofs-of-concept that do not include documentation supporting the necessity or benefit of the plan or concept. Competitive approaches in this application segment should be clearly defined in the application;
- Undifferentiated products, incremental advances or duplicative products;
- Projects lacking substantial impact from federal funds. This subtopic intends to fund projects where federal funds will provide a clear and measurable impact, (e.g. retiring risk sufficiently for follow-on

investment or catalyzing development.) Projects that have sufficient monies and resources to be executed regardless of federal funds are not of interest;

- Applications focusing exclusively on HVAC or water heating applications;
- Products or solutions for systems which do not tie to the electric grid (i.e. wholly off-grid applications, portable power, solar fuel);
- Software to facilitate system design or system monitoring;
- Any software solution to improve customer acquisition processes.

This subtopic seeks to assist independent small businesses which can fully support themselves, continue to grow, and successfully bring a new technology into the market. This opportunity is not intended for creating a product, organization, service, or other entity or item which requires continued government support. This subtopic does not intend to fund work that has already received federal support for similar technology at the same technology readiness level.

Questions – contact solar.sbir@ee.doe.gov

References:

[1] https://energy.gov/solar-office
[2] https://www.energy.gov/articles/energy-department-announces-achievement-sunshot-goal-new-focus-solar-energy-office
[3] https://www.energy.gov/eere/solar/goals-solar-energy-technologies-office

Subtopic c) References:

[1] https://www.energy.gov/oe/office-electricity

Subtopic e) References:

[1] https://www.cooperative.com/content/public/maps/esri-solar-story-map/index.html

Subtopic f) References:

[1] U.S. Department of Energy, Energy Information Administration, International Energy Outlook 2017, DOE/EIA-0484 (2017)
[2] https://www.nrel.gov/docs/fy17osti/68105.pdf

7. VEHICLES

Maximum Phase I Award Amount: (b)(5)	$200,000	**Maximum Phase II Award Amount:** (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		**Accepting STTR Phase I Applications:** YES	

Last year, vehicles transported 11 billion tons of freight, more than $32 billion worth of goods each day, and moved people more than 3 trillion vehicle-miles. The U.S. Department of Energy's Vehicle Technologies Office

(VTO) provides low cost, secure, and clean energy technologies to move people and goods across America. VTO (https://www.energy.gov/eere/vehicles/vehicle-technologies-office) [1] focuses on reducing the cost and improving the performance of vehicle technologies(b) (5) -including advanced batteries, electric traction drive systems, lightweight materials, advanced combustion engines, and advanced fuels and lubricants. VTO supports the development and deployment of advanced vehicle technologies, including advances in electric vehicles, engine efficiency, and lightweight materials. Since 2008, the Department of Energy has helped reduced the costs of producing electric vehicle batteries by more than 75%. DOE has also pioneered improved combustion engines that have saved billions of gallons of petroleum fuel, while making diesel vehicles as clean as gasoline-fueled vehicles.

Applications may be submitted to any one of the subtopics listed below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. Multi-Year Program Plan (MYPP) or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data
- Applications that duplicate research already in progress will not be funded; all submissions therefore should clearly explain how the proposed work differs from other work in the field.

Grant applications are sought in the following subtopics:

a. Electric Drive Vehicle Batteries

Applications are sought to develop electrochemical energy storage technologies that support commercialization of micro, mild, and full HEVs, PHEVs, and EVs. Some specific improvements of interest include the following: new low-cost materials; alternatives or recycling technologies of energy storage critical materials defined at: https://www.energy.gov/policy/initiatives/department-energy-s-critical-materials-strategy [1]; high voltage and high temperature non-carbonate electrolytes; improvements in manufacturing processes – specifically the production of mixed metal oxide cathode materials through the elimination or optimization of the calcination step to reduce cost and improve throughput, speed, or yield; novel SEI stabilization techniques for silicon anodes; improved cell/pack design minimizing inactive material; significant improvement in specific energy (Wh/kg) or energy density (Wh/L); and improved safety. Applications must clearly demonstrate how they advance the current state of the art and meet the relevant performance metrics listed at www.uscar.org/guest/article_view.php?articles_id=85 [2].

When appropriate, the technology should be evaluated in accordance with applicable test procedures or recommended practices as published by the Department of Energy (DOE) and the U.S Advanced Battery Consortium (USABC). These test procedures can be found at www.uscar.org/guest/article_view.php?articles_id=86 [3]. Phase I feasibility studies must be evaluated in full cells (not half-cells) greater than 200mAh in size while Phase II technologies should be demonstrated in full cells greater than 2Ah. Applications will be deemed non-responsive if the proposed technology is high cost; requires substantial infrastructure investments or industry standardization to be commercially viable; and/or cannot accept high power recharge pulses from regenerative breaking or has other characteristics that

prohibit market penetration.~~-~~ Applications deemed to be duplicative of research that is already in progress or similar to applications already reviewed this year will not be funded; therefore, all submissions should clearly explain how the proposed work differs from other work in the field.

Questions – contact Samm Gillard, Samuel.Gillard@ee.doe.gov

b. SiC devices suitable for Electric Vehicle Extreme Fast Chargers

The push to reduce charging time through Extreme Fast Charging (XFCs) ~~needed~~ for Battery Electric Vehicles (BEVs) creates a suite of intertwined R&D challenges. In addition to the R&D challenges for vehicles and battery technologies, there is a distinct need to understand how fast charging up to 400 kW will impact Electric Vehicle Service Equipment (EVSE) and XFC-related infrastructure costs. Design of these charging stations needs~~-~~ to include ~~take into account a host of different issues including~~ power electronics that can withstand elevated current and voltage levels for vehicle charging. Performance requirements and gaps for XFCs can be found at:
https://www.energy.gov/sites/prod/files/2017/10/f38/XFC%20Technology%20Gap%20Assessment%20Report_FINAL_10202017.pdf [1].

~~Given~~ ~~I~~the planned voltage and current levels for XFC, ~~these systems~~ require ~~necessitate~~ high power semiconductors to achieve high power levels and short recharge times. A medium voltage grid input can reduce installation costs and increase efficiency for vehicle charging,~~-~~ ~~u~~using solid state approaches to grid isolation and power conditioning, and ~~which~~ can contribute to grid reliability and resilience as well as national security.~~-~~ In particular, high voltage Silicon Carbide (SiC) devices (b) (5)
with their inherently high breakdown voltage and low loss characteristics are suited to fast charging applications. This subtopic seeks proposals ~~-~~to develop devices with higher current and voltage ratings that will enable improvements in vehicle extreme fast chargers.

This subtopic seeks proposals ~~to~~ that ~~address this~~overcome the limitations of currently available technologies by ~~barrier through~~ demonstrating the successful production of > 150A, > 1200V rated SiC devices that are suitable for extended use in high power EVSEs. Specifically, prototypes ~~devices~~ produced in Phase II should ~~show application readiness through~~ passing full or partial qualification specifications or standards at high device production yields. In Phase I, ~~D~~device production quantities are not expected to be sufficient to pass full qualification ~~for Phase 1 projects~~. ~~Where possible,~~ In Phase I, applicants should show a relationship to, and demonstrate an understanding of, electric vehicle charging application requirements and environments. Examples include fast charging requirements for surface and/or substrate treatments and processing, ~~;~~ compatibility with existing power module, or power stage packaging and processing. ~~;~~Other requirements are related to ~~and~~ design for long-term reliability ~~such~~ even with ~~as~~ device degradation. ~~Projects~~ Proposals should show a path towards full qualification of XFS technologies with commercial-ready devices integrated into a functional module by the end of Phase II.

Questions – contact: Steven Boyd, steven.boyd@ee.doe.gov

c. Reduction of Thermal and Friction Losses in Internal Combustion Engines

Applications are sought to develop technologies that can provide significant fuel efficiency gains to reciprocating internal combustion engines without appreciable increases in cost or complexity. Potentially effective approaches for increasing efficiency include improved thermal management strategies, such as use of thermal barrier coatings or efficient, low-cost waste heat recovery strategies, and friction reduction strategies, such as use of low friction coatings or surfaces. Refer to the Advanced Combustion and Emission Control Roadmap here: https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf [1].

Applications must demonstrate that the target technologies:

- Are viable in current reciprocating engine architectures;
- Are compatible with widely available fuels and lubricants;
- Have a low expected additional cost to implement on an automotive or heavy-duty engine;
- Work reliably for the typical lifetime of the vehicle;
- Are likely to be successfully implemented on a modern, production automotive engine in Phase II.

Reporting must include fuel consumption test results compared with a second, unmodified, otherwise identical engine. All fuel consumption testing must be conducted according to engine industry norms. Statistically valid fuel economy improvements (95% confidence level) of at least 2.0% are desired.

Questions – contact: Mike Weismiller, Michael.Weismiller@ee.doe.gov

d. Co-Optimization of Fuels and Engines

On-road transportation is likely to remain reliant on liquid fuels for decades, due to the superior energy density and fast refueling times that liquids afford. As a result, although electrification has promise to displace internal combustion engines in some applications, advances in combustion will still have substantial impact on transportation-based energy consumption and emissions [1]. While benefits can be obtained by improving fuel resources or engine designs independently, an even larger impact can be had by optimizing new fuels and engines in conjunction with each other. For example, rather than finding new fuels that can be integrated into existing engines – such as higher ethanol blends in stock gasoline engines, and biodiesel into typical Diesel engines – or making incremental refinement of existing engines using traditional fuels, there is even greater opportunity in developing new engines to harness the unique properties of alternative fuels. As a result, grant applications are sought to develop engine designs that are co-optimized for operation on a non-traditional liquid fuel, including:

- Light-duty engine designs that utilize a multi-mode combination of spark-ignition and compression-ignition of biomass-based liquid fuel blends to optimize engine operation across the entire load map. These engines should be able to demonstrate at least a 10% improvement in fuel economy over baseline spark-ignition-gasoline operation (i.e., comparable engine on AKI 87 gasoline).
- Medium- and heavy-duty engine designs that use non-diesel/biodiesel liquid fuels in compression-ignition architectures. At minimum, such approaches should be able to achieve traditional Diesel torque and efficiency, but with a significant reduction in criteria pollutants and carbon impact.
- Non-traditional engine designs (such as opposed piston engines, or similar architecture deviations) that operate on a suitably co-optimized liquid alternative fuel. The benefits for such technologies must be proportional to the level of deviation required from traditional engine production processes.

Applications that heavily rely on fuels/additives that are not currently produced at significant scale should include techno-economic analysis to justify commercial potential.

Questions – contact: Kevin Stork, kevin.stork@ee.doe.gov

e. Improving the Performance and Reducing the Weight of Cast Components for Vehicle Applications

The Vehicle Technologies Office Materials Technology Program targets 25% glider weight reduction at less than $5/~~lb~~lb. saved by 2030. Materials play a major role in the U. S. DRIVE Partnership by enabling lightweighting of structures and systems to improve fuel economy and by reducing demands on the vehicle powertrain and ancillary systems [1]. To accomplish these goals it is necessary to reduce the weight of all components within the vehicle. Cast metal components, made from cast iron, aluminum alloys, and magnesium alloys represent a significant percentage of the total vehicle weight and will need to be addressed to meet the stated goals. Although weight reductions can be achieved through materials substitution, the performance of cast metal components is often dominated by the imperfections in the casting that result from the casting process.

Applications are sought to develop and improve casting processes that result in a significant reduction in casting imperfection leading to increases in component strength, fatigue life, and allowing redesigns that lead to significant (>20%) reductions in component weight.

Applications should provide baseline data on target casting process, component, component performance, and baseline material composition(s) and properties. Proposals should include a clear description of the imperfections to be addressed and the methodology to be employed to make the proposed improvements.

Applications should show a pathway to commercial high volume production rates necessary for the automotive industry and demonstrate that there is a high likelihood that the cost effectiveness targets of $5/~~lb~~lb. saved can be achieved by 2030.

This topic does not include a new materials development program and applications containing a new materials development program will be considered out of scope.

Questions – contact Jerry Gibbs, jerry.gibbs@ee.doe.gov or Sarah Kleinbaum, sarah.kleinbaum@ee.doe.gov

f. Low Cost, Lightweight, and High-Performance Fiber-Reinforced Composites for Vehicle Applications

The Vehicle Technologies Office's Materials Technology Program targets 25% glider weight reduction at less than $5/~~lb~~lb. saved by 2030. Materials play a major role in ~~the~~ DOE's U. S. DRIVE Partnership by enabling vehicle lightweighting of structures and systems to improve fuel economy and reduce demands on the vehicle powertrain and ancillary systems. The Materials Technical Team in the U.S. DRIVE updated its roadmap in October 2017[1]. Within this roadmap, the area of carbon fiber composites~~,~~ is one of the four material systems of the most interest to the automotive industry ~~is most interested in.~~ While the c~~C~~urrent materials focus of the DRIVE partnership is solely for primary structure applications~~; however~~, there are many secondary structures of vehicle components in the automotive industry, which are also critical and ~~important and in~~ ~~with~~ high demand ~~to the automotive industry~~.

Applications are sought to develop and test new innovative materials ideas including carbon fiber and ~~beyond the~~ carbon fiber ~~and their~~ composites. In addition to research on low cost carbon fiber, ~~research,~~ applications can include development of alternative fibers (e.g., natural fiber/bio-degradable fiber) and resins (e.g., polymers, bio-degradable polymer, fast curing resin), and their processes or any forms of the fiber-reinforced materials such as (continuous, discontinuous, particulate fibers, or hybrid that can make ~~benefit~~ vehicle's lightweight and high performance with affordable cost. Applications can also include development of innovative and cost-effective manufacturing processes, such as low-cost, high-speed manufacturing with net shape. In particular, applications are sought to, reduc~~ing~~e manufacturing cycle time to less than 3 minutes (ideally for 90 seconds), and develop~~ment~~ ~~of~~ composite intermediates (e.g., prepregs, injection molding compound, SMC, BMC, long-fiber thermoplastics, non-crimp fabrics, and nonwovens). For such applications the ~~in which~~ the expected outcomes ~~can significantly help and~~ should support the automotive industry in utilizing fiber-reinforced composites in high-volume production.

The process from manufacturing carbon fiber to production of finished components is wasteful; it is estimated that more than 30% of produced carbon fiber ends up as waste at some point in the process. ~~One area t~~The carbon fiber composites industry differs from other automotive materials supply industries in its (b) (5) lack of an effective recycling solution and recyclability. Applications are also sought to develop viable recyclability technologies that can help ~~save~~ reduce carbon fiber or non-carbon fiber composites waste. Applications also are sought for technologies that promote ~~and for future~~ lightweight vehicle reusability.

Questions – contact Felix Wu, felix.wu@ee.doe.gov or Will James, charles.james@ee.doe.gov

References:

[1] Vehicle Technologies Office (FCTO) https://www.energy.gov/eere/vehicles/vehicle-technologies-office

Subtopic a) References:

[1] Critical Materials Strategy:
https://www.energy.gov/policy/initiatives/department-energy-s-critical-materials-strategy
[2] USABC Energy Storage System Goals http://www.uscar.org/guest/article_view.php?articles_id=85
[3] USABC Manuals: www.uscar.org/guest/article_view.php?articles_id=86

Subtopic b) References:

[1] Enabling Fast Charging: A Technology Gap Assessment:
https://www.energy.gov/sites/prod/files/2017/10/f38/XFC%20Technology%20Gap%20Assessment%20Report_FINAL_10202017.pdf

Subtopic c) References:

[1] Advanced Combustion and Emission Control Roadmap:
https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf

Subtopic d) References:

[1] Advanced Combustion and Emission Control Roadmap:
https://www.energy.gov/sites/prod/files/2018/03/f49/ACEC_TT_Roadmap_2018.pdf

Subtopic e) References:
[1] Materials Technical Team Roadmap:
https://www.energy.gov/eere/vehicles/downloads/us-drive-materials-technical-team-roadmap

Subtopic f) References:
[1] Materials Technical Team Roadmap:
https://www.energy.gov/eere/vehicles/downloads/us-drive-materials-technical-team-roadmap

8. WATER

Maximum Phase I Award Amount: (b) (5)	$200,000	*Maximum Phase II Award Amount:* (b) (5)	$1,100,000
Accepting SBIR Applications: **YES**		*Accepting STTR Applications:* **YES**	

The Office of Energy Efficiency and Renewable Energy's Water Power Technologies Office (WPTO) (http://energy.gov/eere/water/water-power-program) conducts early-stage research and development to strengthen the body of scientific and engineering knowledge enabling industry to develop new technologies that increase U.S. hydropower and marine and hydrokinetic (MHK) generation. Hydropower and MHK ~~energy~~ technologies generate renewable electricity that supports domestic economic prosperity and energy security while enhancing the reliability and resiliency of the U.S. power grid.

MHK technologies convert the energy of waves, tides, and river and ocean currents into electricity and have the potential to provide locally sourced, clean, and reliable energy. MHK is a predictable, forecastable resource with a generation profile complimentary to the seasonal or temporal variations of other renewable resources such as onshore wind and solar, which can enhance its contributions to grid resilience and reliability. MHK technologies also have the potential to provide cost-effective energy for numerous existing maritime markets, including non-grid connected or remote coastal areas, ocean-based sensors, monitoring equipment (for civilian, scientific, industrial, and national security functions), and autonomous vehicle recharging at sea, as well as reducing desalination costs by avoiding the step of generating electricity.

Applications may be submitted to any of the subtopics below but all applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline;
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis; and;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

During Phase II, DOE may consider providing additional resources for up to 150 labor-hours at one or more national laboratories ~~time~~ in addition to the SBIR/STTR funding to the applicants if needed. Such national laboratory resources may be useful ~~to assess~~ for testing and performance assessment. If the applicant(s) desire such national laboratory resources they must include a description of the resources required.

Grant applications are sought in the following subtopics:

a. Microgrid for Improved Resilience in Remote Communities through Utilization of Marine Hydrokinetics and Pumped Storage Hydropower

Applications are sought ~~for developing~~ to prove the concept of microgrids for remote rural communities. Applicants should show how such microgrids ~~that~~ enhance the ability of marine hydrokinetics (MHK) technologies to contribute to grid reliability and resilience. Inclusion of MHK should offer the capability to reliably provide base load power in these communities in a resilient manner. ~~.~~The application should demonstrate how MHK ~~that~~ is less exposed to extreme weather events than other renewable resources.

In 2017, the National Academy of Sciences found that "~~"~~There is enormous technical potential to using microgrids to make electric service more resilient. This field of research and application is evolving quickly with new control systems, sensors, and distributed energy sources. This rapid evolution of the frontier of technical capabilities is opening a potentially wide gulf between the technical capabilities of microgrid systems and the real world systems that are operational."~~"~~ To help bridge this gulf, ~~the~~ WPTO is interested in proof of concept research on real world applications of marine renewable energy (MRE) technologies that can operate as a base load power supply ~~in~~ for small microgrid systems (100KW-1MW) ~~to~~ that provide power to remote communities. The proof of concept research should demonstrate the extent to which the following assertions are true:

- (b) (5)

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- Remote rural communities that are vulnerable to power outages resulting from extreme weather events can benefit from microgrids because they are more resilient power supply systems.
- Mi~~M~~icrogrids from renewable power sources ~~also have the potential to~~can reduce energy costs in communities that are dependent on diesel fuel for power.
- Incorporating Marine current energy devices into microgrids can reduce their ~~, in particular, are less~~ expose~~d~~ure to extreme weather events ~~and thus more resilient than~~ compared with other renewable sources.
-

Phase I awards under this topic will prove the concept for ~~evaluate the Feasibility of a~~the proposed microgrid based on the following:

- Identification of a specific rural community, with average annual electrical demand 100KW-1MW, that currently relies on diesel generators (DG) as primary power supply, and has nearby current energy (river or tidal) resources available to support microgrid operations;~~.~~
- Possible inclusion of pumped-storage hydropower (PSH), utilizing either natural or man-made water reservoirs, for energy storage requirements to meet electrical grid requirements~~.~~;
- ~~The system is intended to r~~Replacement of the DGs, though DGs can be included for back-up power, i.e. the system should be capable of operating with the MHK devices supplying baseload operations without utilization of DG~~diesel generators~~.
- ~~The study should i~~Inclusion of~~de~~ preliminary designs, including specific inverters, controllers and other major component requirements, and the associated system life cycle cost estimates~~.~~; and

- ~~The study should compare l~~Life cycle cost comparisons for proposed system, based on available resources for particular community of interest, to the cost associated with the community's current ~~diesel generator~~DG operations, maintenance and fuel.

Phase I should include component level testing required to complete the system design.- It should also include testing plans to occur in the specific laboratory environment proposed for phase two.
The proposed research ~~The study~~ should identify and model a system consisting of optimal mix of renewable and other local energy resources as appropriate, as well as storage requirements, to serve the community's energy needs.

In Phase II the researchers would ~~awards under this topic will~~ complete design and test the system in a laboratory environment utilizing Hardware in the Loop (HIL) to the greatest extent practical at facility such as NREL's National Wind Technology Center (NWTC) or the University of Alaska, Fairbanks' Power Systems Integration Lab at the Alaska Center for Energy and Power (ACEP).

Phase II must also include an evaluation of global potential for microgrids for improved resilience in remote communities with average annual electrical demand 100KW-1MW through utilization of MHK and PSH.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

b. Ocean Energy Storage Systems

Energy storage is a critical component of renewable energy systems to overcome intermittency. Research on electrochemical storage methods, and integration with renewable energy generation sources, has thus far focused on land-based systems such as solar and onshore wind. Generally these systems are poorly suited for the marine environment and are not optimized for integration with marine energy systems such as wave energy converters or tidal energy turbines. The WPTO has identified numerous non-grid applications that could benefit from marine energy, but nearly all of them require an energy storage component. Examples include charging underwater vehicles at sea, powering ocean research devices, and providing emergency sources of electricity. For a marine energy converter to successfully enter these markets it must have a well-defined and reliable energy storage system.

WPTO seeks to fund research and development on ~~f~~novel ocean energy storage systems that can provide functions similar to electrochemical battery storage and are designed for integration with marine energy systems.- Examples ~~of research~~ could include systems using pneumatic, hydraulic, or thermal energy storage. Ocean energy storage could also include systems that are analogous to compressed air energy storage (CAES) or pumped-hydro storage (PHS), but operate underwater using the weight of the water column to pressurize a fluid or gas. Novel electrochemical storage systems that require ocean water for operation may be considered if marine energy conversion is clearly described as an integral component of the design. -The WPTO will consider technologies for various scales and capacities, though the end use application must be clearly identified.

Phase I awards under this topic will carry out early-stage, proof-of-concept research into novel marine energy storage concepts in a laboratory setting. -Phase I research should involve definitione and design of a storage system and ~~perform~~ sufficient laboratory testing to inform the relative merits of the technology and its potential for scaling-up or commercialization. Phase I ~~L~~laboratory work may include initial research to guide

design. It also may include, testing of initial components and designs, or other necessary steps in early-stage development. In Phase II, the awardee(s) will should continue to develop the proposed ocean energy storage system identified in Phase I by building a functioning prototype system and testing it in an intended environment or in a laboratory setting using hardware-in-the-loop testing regime. -Phase II awardee(s) must present a clear path for the commercialization of the proposed technology.

Applicants must demonstrate knowledge, experience, and capabilities in developing ocean energy storage systems and include the following in their application:

- A clear description of the specific end-use application for the storage system; for example, charging underwater vehicles or aerial drones, balancing the grid, or offshore aquaculture farms.;
- Required system components, including but not limited to: interconnection, mating, or delivery hardware that allows the storage system to deliver energy to the specified application (e.g. docking station for underwater vehicles or drones),; including the power management system and controllers and; other auxiliary systems;,
- If applicable, how the system can be charged by marine energy systems such as wave, tidal, or ocean current energy converters;.
- The state-of-the-art for incumbent technologies and how the proposed design will overcome existing limitations or pain points faced by end-users.;
- Capacity rating, rates of charge and discharge, and cycling characteristics of the proposed system should be included;
- Details of work to be performed in Phase I including the design plan, the resources required, and the intended performance targets; and
- Description of Phase II work including the scale of the demonstration prototype, the desired test location or facility, and if possible, end-user partners.

Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, what the commercialization plan is for the energy storage system to be developed under this subtopic.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

c. Pumping and Compression using Marine and Hydrokinetic Energy

Water pumping is required for many different types of operations, including: a) cooling for manufacturing, and data centers, b) air conditioning, or c) power generation plants;, d) seawater desalination, e) irrigation of crops,; f) onshore and offshore aquaculture, and g) or pumped-storage hydro,. among many others. Compression is needed for refrigeration or other systems applications that use gases or compressible liquids as their working fluid.

Where When these applications are exist in off-grid areas, the power for pumping or compression is typically provided by diesel generators, (b) (5) - MHK may be able to supplant these costly and polluting fossil fuel powered pumps and compressors using the energy contained in oceans and rivers.

MHK pumping has often been considered for desalination systems, in particular wave powered reverse osmosis systems. However, challenges remain in determining how best to integrate ~~these~~ MHK technologies. Wave energy converters often act as intermittent positive displacement pumps, delivering seawater at variable flow and non-constant pressures, occasionally resulting in water hammer effects. -These pressure fluctuations can be damaging for downstream system components, such as membranes, filters, heat exchangers, or valves. Research addressing these issues is elemental to many different off-grid applications for MHK technologies that require pumping or compression, as well as riverine applications such as freshwater aquaculture or crop irrigation.

WPTO seeks to fund research and development of novel MHK-powered pumping or compression systems to directly pump water or compress gases for off-grid applications. Steady flow, high-head (for pumping systems), high-efficiency designs with minimal maintenance are of particular interest. -Research should identify specific end-users or applications for the system and clearly demonstrate how the proposed technology meets customer needs.

Phase I awards under this topic will carry out early-stage, proof-of-concept research into novel MHK pumping or compression systems. Phase I research should ~~define and~~involve design of a pumping or compression system and should involve ~~perform~~ sufficient laboratory testing to inform the relative merits of the technology compared to incumbent technologies and its potential for scaling-up or commercialization. Consideration must be given to the delivery system which will deliver the working fluid to the end-user or application. In Phase II the awardee(s) will continue to develop the proposed MHK pumping or compression system by building a functioning prototype and testing in an intended environment or in a laboratory setting using a hardware-in-the-loop testing regime.

Applicants must demonstrate knowledge, experience, and capabilities in developing MHK pumping systems and include a description of the following in their application:

- ~~A clear description of t~~The specific end-use application for the pumping or compression system and how it will meet end-user requirements, e.g. wheat crop irrigation in remote communities to supply 10 m3/hr with a total dynamic head of 150 meters for a pumping system;
- The MHK resource that will be used to power the system;~~.~~
- The state-of-the-art for incumbent technologies and how the proposed design will overcome existing limitations, costs, or other pain points faced by end-users~~.~~;
- The predicted volumetric flow rate, total dynamic head, and other relevant calculated performance characteristics of the intended system as applicable~~.~~;
- The predicted electrical power or fuel displaced by the proposed design;~~.~~
- Details of work to be performed in Phase I including the design plan, the resources required, and the intended performance targets~~.~~; and
- ~~Description of~~ The Phase II work including the scale of the demonstration prototype, the desired test location or facility, and if possible, end-user partners.

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Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, the commercialization plan for the MHK pumping or compression system to be developed under this topic.

Questions – contact: Rajesh Dham, rajesh.dham@ee.doe.gov

d. High Value Critical Mineral Extraction from the Ocean Using Marine Energy

The demand for reliable sources of critical minerals is growing, based on likely future scarcities and security concerns for obtaining minerals from international sources that may not be readily accessible to the United States. Most rare earth elements (REEs) and valuable minerals used in the United States are imported from other nations. This reliance on foreign supply constitutes an industrial and national security concern. ~~-~~The development of lower-cost domestic extraction of minerals from the ocean will make these sources more economically attractive and~~;~~ help alleviate international supply concerns. ~~;~~ Use of ocean sources of critical materials also will ~~and relieve~~ avoid permitting, waste disposal, and public opinion concerns ~~for~~ associated with terrestrial mining operations. Of particular importance are those elements for which the United States does not have significant domestic resources or for which there is significant risk of supply disruption. Elements that are considered critical include the REEs (e.g., neodymium, dysprosium, europium, yttrium, and terbium), lithium, tellurium, gallium, and indium.

Seawater contains large amounts of minerals, dissolved gases, and specific organic molecules that can play a role as energy sources or ~~in~~ for other industrial uses. Some of the most valuable minerals include the 17 REEs, precious metals, lithium, and uranium. Seawater minerals are generally distributed evenly in seawater. These minerals can be recovered from seawater using adsorption methods that do not require filtering vast amounts of seawater.

Marine Energy could open up unexploited opportunities in seawater mining, which could further expand mineral and gas markets. Seawater mining would also improve the diversity of the U.S. mineral supply chain, eliminating reliance on any one supplier. The availability of marine sources of critical material would ~~, and~~ provide a price ceiling on the cost of terrestrially obtained critical materials. Extraction of minerals from seawater requires power to operate mechanical adsorbent exposure mechanisms, pump seawater, and operate the electrochemical cell in electrochemical extraction systems.

WPTO seeks applications for developing alternatives to foreign-sourced critical materials using marine energy to address US security, trade gaps, and mineral scarcity. Critical materials include, but are not limited to, rare earth elements.

In Phase I awardees will carry out (1) ~~a~~ proof of concept research which includes appropriate lab testing for extracting minerals from sea water using marine energy; (2) a study to understand economics and scales to extract high value minerals commercially; and (3) development of ~~design~~ a prototype for testing in Phase II. ~~-~~In Phase II the awardee(s) will build and test a promising mineral extraction technology powered by a small scale marine energy device.

Applicants must also demonstrate knowledge, experience, and capabilities in marine energy capture as well as an understanding of sea water mineral extraction technologies and include the following descriptions in their application:

- ~~Description of~~ Tthe required marine energy generation infrastructure and power requirements;
- ~~Description of~~ Mmineral extraction technologies and efficiencies being considered;
- Concepts on platforms for concentrated mineral solute transfer or similar materials transfer;
- ~~Identification of~~Tthe US mineral trade gaps-/-mineral security that could be commercially addressed by this technology;
- US Exclusive Economic Zone (EEZ) siting options with marine energy resource assessment alignment for: wave, tidal, current, and/-or OTEC;
- Details of work to be performed in Phase I; and
- ~~Description of~~ Phase II work including use of national lab resources if desired by the applicant.

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Applicants should also detail how they propose to utilize the grant to advance the state-of-the-art, and, if successful, the commercialization plan for high value mineral extraction from the ocean using marine energy to be developed under this topic.

Questions – Contact: Rajesh Dham, rajesh.dham@ee.doe.gov

Subtopic a) References:

[1] National Academies of Sciences, Engineering, and Medicine. 2017. Enhancing the Resilience of the Nation's Electricity System. Washington, DC: The National Academies Press.
[2] Burr, Michael, Camilleri, John, Lubkeman, David, Long, Qian, and Du, Yuhua. Microgrid optimized resource dispatch for public-purpose resiliency and sustainability. United States: N. p., 2017. Web.
[3] Baring-Gould, Edward I., Haase, Scott G., Jimenez, Antonio, and Olis, Daniel R. Kokhanok Renewable Energy Retrofit Analysis. United States: N. p., 2017. Web. doi:10.2172/1418968.
[4] Giraldez Miner, Julieta I, Singh, Shruti, and Gao, David Wenzhong. Cost Analysis of Renewable Energy-Based Microgrids. United States: N. p., 2017. Web. doi:10.1109/NAPS.2017.8107241.
[5] -Hernando, Daniel, Farahmand, Hossein, Holttinen, Hannele, Kiviluoma, Juha, Rinne, Erkka, Söder, Lennart, Milligan, Michael, Ibanez, Eduardo, Martínez, Sergio Martín, Gomez-Lazaro, Emilio, Estanqueiro, Ana, Rodrigues, Luis, Carr, Luis, van Roon, Serafin, Orths, Antje Gesa, Eriksen, Peter Børre, Forcione, Alain, and Menemenlis, Nickie. Hydro power flexibility for power systems with variable renewable energy sources: an IEA Task 25 collaboration: Hydro power flexibility for power systems. United States: N. p., 2016. Web. doi:10.1002/wene.220.

Subtopic b) References:

[1] EnergieSpeicher. 2017. "Storing energy at sea." http://forschung-energiespeicher.info/en/projektschau/gesamtliste/projekt-einzelansicht/95/Kugelpumpspeicher_unter_Wasser/
[2] Shepard News. 2015. "US works on underwater UUV recharging." August 25. 4137 https://www.shephardmedia.com/news/uv-online/us-works-underwater-uuv-recharging/.

[3] The Economist. 2016. "Depths of imagination: Pumped storage gets a makeover." https://www.economist.com/science-and-technology/2016/11/05/depths-of-imagination
[4] Townsend, Nicholas, and Ajit Shenoi. 2013. "Recharging autonomous underwater vehicles from ambient wave 4175 induced motions." Oceans. San Diego, CA. September 23–27, 2013.

Subtopic c) References:

[1] Energy Smarts. 2013. "Massachusetts Oysters Go Solar." March 27. http://blog.mass.gov/energy/green-3748 business/massachusetts-oysters-go-solar/.
[2] Google Data Centers. n.d. "Efficiency: How we do it." Accessed April 7, 2018. 3808 https://www.google.com/about/datacenters/efficiency/internal/.
[3] Gunawan, Budi, Vincent S. Neary, Josh Mortensen, and Jesse D. Roberts. 2017. Assessing and Testing 3824 Hydrokinetic Turbine Performance and Effects on Open Channel Hydrodynamics: An Irrigation Canal Case 3825 Study. U.S. Department of Energy, DOE/EE-1537. 3826. https://www.energy.gov/sites/prod/files/2017/04/f34/Assessing-Testing-Hydrokinetic-Turbine-Performance-3827 Effects.pdf.
[4] Toner, Damien, and Mo Mathies. 2002. "The Potential for Renewable Energy Usage in Aquaculture." 4173 Aquaculture Initiative. 54 pp. http://www.aquacultureinitiative.eu/Renewable%20Energy%20Report.pdf.

Subtopic d) References:

[1] DE-FOA-0001885: RFI: Marine and Hydrokinetic Technologies: Maritime Markets Report - Potential Maritime Markets for Marine and Hydrokinetic Technologies: Draft Report April 2018 – Chapter 7 Seawater Mining: Minerals and Gasses
https://eere-exchange.energy.gov/#Foaldb8a4d4f5-1398-438d-afe1-876763816a8c

9. WIND

Maximum Phase I Award Amount: (b)(5)	$200,000	Maximum Phase II Award Amount: (b)(5)	$1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Office of Energy Efficiency and Renewable Energy's Wind Energy Technologies Office (https://energy.gov/eere/wind/wind-energy-technologies-office), seeks applications for innovations that significantly reduce the cost of energy from U.S. wind power resources for land-based, offshore and distributed wind turbines. The Wind Energy Technologies Office (WETO) is seeking proposals for technology innovations with the potential to enable wind power to generate electricity offshore and in all 50 states cost competitively with other sources of generation.

Today, wind energy provides over 6% of the nation's total electricity generation. At the end of 2017, over 81,000 wind turbines, totaling 1,076 megawatts (MW) in cumulative capacity, were deployed in distributed applications across all 50 states, the District of Columbia, Puerto Rico, Guam, and the U.S. Virgin Islands. Additionally, 89 gigawatts (GW) of utility-scale wind turbines are installed across 41 states plus Puerto Rico and Guam. Finally, one of the smallest states in terms of both geographic size and installed wind capacity marked a major milestone in 2016, as the nation's first offshore wind project, the 30 MW Block Island project in Rhode Island, achieved commercial operation. With wind power generation exceeding 10% in 14 states, wind is a demonstrated clean, affordable electricity resource for the nation.

WETO aims to advance scientific knowledge and technological innovation to enable clean, low-cost wind energy options nationwide. WETO Research, Development, Demonstration and Deployment (RDD&D) activities are applicable to utility-scale land and offshore wind markets, as well as distributed turbines—typically interconnected on the distribution grid at or near the point of end-use. Achieving LCOE goals will support deployment of wind at high penetration levels, sufficient to meet up to 20% of projected U.S. electricity demand in 2030, and up to 35% in 2050, compared to over 6% of demand in 2017. DOE plays a unique and valuable role in enabling the wind industry and its stakeholders to meet core challenges to industry growth through innovation to reduce wind technology costs and mitigate market barriers enables deployment and drives U.S. economic growth.

All applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. Vision or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis and; justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Coordinated and Secure Distributed Wind System Control and Communications Technologies

(b) (5)

(b) (5) Early stage research and technology development is needed for higher penetrations of distributed energy resources (DERs) to integrate with existing electricity distribution networks, contribute to grid reliability, and provide resilience when the bulk power system fails. Interoperability between wind technology and other distributed energy resources (e.g. solar and storage) and the flexible electricity loads they support (e.g. buildings) can enable higher penetration through coordinated and secure controls and communications technologies. The goal of this subtopic is to make these capabilities available for wind energy technology, at all scales used in distributed applications, through the development of low-cost, validated and secure control and communication technologies. Proposals should address technical challenges related to wind technology specifically in Phase I, while addressing the common communication and cybersecurity requirements for all

distributed energy resources. In addition, proposals should consider how to complement solar and/or storage technologies to advance the interests of multiple EERE programs in Phase II. [1, 2]

(b) (5)

Questions -- contact Michael Derby, michael.derby@ee.doe.gov

b. Remote Diagnostic Technologies to Reduce Offshore Wind Operating, Maintenance, and Repair Costs, and Increase System Reliability

(b) (5)

Accessing an offshore wind turbine for service work is far more expensive than accessing a land-based wind turbine -- technicians need to be transported long distances by boat, which requires more personnel and time, and can be delayed by weather. This, in turn, increases overall operations and maintenance (O&M) costs for an offshore wind plant, as well as lost revenue caused by unplanned downtime. Remote monitoring, inspection, and repair of offshore wind turbines and foundations can reduce O&M costs and avoid losses in energy production. To date, the field of remote diagnostics for offshore wind is not well-developed in the global marketplace and could benefit from adaptation of advanced technologies, materials and manufacturing processes being developed by U.S. firms for other applications. The larger scale, greater distances from shore, and generally harsher operating conditions of planned U.S. offshore wind projects compared to those in

Europe, where most offshore development to date has taken place, provide an impetus for U.S. innovation in remote diagnostic technologies, while also resulting in significant global market potential.

WETO is seeking proposals for development or adaptation of innovative technologies to increase offshore wind plant operators' abilities to remotely monitor operating details of turbines and component subsystems in order to plan service events in advance of possible failures, and decrease the need for on-site technician time. Innovative technologies to be proposed may include hardware, sensors, instruments, and/or software tools. These technologies can facilitate maintenance and repair processes, such as: detection of a system operating outside of its normal parameters, inspection and identification of the root cause of the problem, quantification of how it will impact overall health of the machine, decision making on the proper course of action, and planning the repair or other preventative measures. If included as part of innovative hardware development, software may utilize advances in artificial intelligence and should ensure cyber security of the wind plant. WETO is seeking solutions to address a broad range of factors impacting reliability, therefore proposed technologies may be applicable to specific elements of an offshore system including blades, foundations, turbine mechanical, turbine electrical, and control electronics. Any hardware developed must be able to function reliably in harsh marine environments, and should integrate into the supervisory control and data acquisition (SCADA) system of the turbine and the wind plant. [3,~~4~~, 4]

Questions – contact Michael Derby, michael.derby@ee.doe.gov

c. ~~Other in~~ Wind Turbine Blade Recycling

In addition to the specific subtopics listed above, WETO invites grant applications in other areas relevant to wind turbine blade recycling that enable wind power nationwide [5,6].

Questions – contact Michael Derby, michael.derby@ee.doe.gov

Subtopic a) References:

[1] Distributed Wind Energy Association (DWEA), 2015, DWEA Distributed Wind Vision – 2015-2030 Strategies to Reach 30 GW of "Behind-the-Meter" Wind Generation by 2030, p. 26. (http://distributedwind.org/wp-content/uploads/2012/08/DWEA-Distributed-Wind-Vision.pdf)
[2] Jenkins, J., Rhoads-Weaver, H., et al., 2013, SMART Wind Roadmap: A Consensus-Based, Shared-Vision Sustainable Manufacturing, Advanced Research & Technology Action Plan for Distributed Wind, Distributed Wind Energy Association, Durango, Colorado, p. 110. (http://distributedwind.org/wp-content/uploads/2016/05/SMART-Wind-Roadmap.pdf)

Subtopic b) References:

[3] U.S. Department of Energy, 2015, Wind Vision: A New Era for Wind Power in the United States, p. 350. doi:10.2172/1220428 (http://energy.gov/sites/prod/files/2015/03/f20/wv_full_report.pdf)
[4] U.S. Department of Energy, U.S. Department of Interior, 2016, National Offshore Wind Strategy: Facilitating the Development of the Offshore Wind Industry in the United States, p. 84. (http://energy.gov/sites/prod/files/2016/09/f33/National-Offshore-Wind-Strategy-report-09082016.pdf)

Subtopic c) References:

[5] U.S. Department of Energy, 2015, Enabling Wind Power Nationwide, p. 56. doi:10.2172/1220457 (http://energy.gov/sites/prod/files/2015/05/f22/Enabling-Wind-Power-Nationwide_18MAY2015_FINAL.pdf)
[6] Larsen, H.H., & Sønderberg Petersen, L., 2014, DTU International Energy Report 2014: Wind Energy — Drivers and Barriers for Higher Shares of Wind in the Global Power Generation Mix, Technical University of Denmark, p. 91-97. (http://orbit.dtu.dk/files/102457047/DTU_INTL_ENERGY_REP_2014_WIND.pdf)

10. JOINT TOPIC: ADVANCED MANUFACTURING AND SOLAR ENERGY TECHNOLOGIES OFFICES

Maximum Phase I Award Amount: (b)(5)	200,000	Maximum Phase II Award Amount: (b)(5)	1,100,000
Accepting SBIR Phase I Applications: YES		Accepting STTR Phase I Applications: YES	

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Solar Energy Technologies Office (SETO) supports early-stage research and development to improve the affordability, reliability, and performance of solar technologies on the grid. A specific effort is devoted to cutting-edge research and development that will help the solar industry to reduce the cost of manufacturing solar technologies to reach the 2030 cost targets [2, 3].

In this Topic, AMO and SETO seek applications for the development of innovative and impactful technologies that will support a strong solar manufacturing sector and supply chain in America, while producing cost-competitive modules that keep pace with the rising domestic and global demand for affordable solar energy. Applications must be responsive to the following subtopic. Applications outside of this area will not be considered. Within this topic, DOE is not interested in technologies and innovations related to racking optimization or mounting technologies. Applications in this space will be deemed non-responsive. However, any innovation in module form factors should have a line of sight to easy deployment using current or soon to come racking/mounting technologies.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Applicants are encouraged to leverage capabilities of consortia from both AMO and SETO. The Rapid Advancement in Process Intensification Deployments (RAPID) Institute is one of AMO's public-private R&D consortia where manufacturers, small businesses, universities, national laboratories, and state and local governments are brought together to pursue coordinated early-stage R&D in high-priority areas essential to

energy in manufacturing, including module manufacturing [4]. SETO's Durable Module Materials (DuraMAT) Consortium [5], brings together national laboratories, universities, and industry to discover and develop new materials, testing methodologies, and designs for durable PV systems.

Grant applications are sought in the following subtopic:

a. Innovation in solar module manufacturing processes and technologies

The global PV market has changed dramatically over the past years. Module prices have been decreasing rapidly and global deployment is experiencing strong growth. However, manufacturing is concentrated mainly in Asia [6]. Innovation-driven cost, performance and quality improvements, along with strong projected solar demand in the United States and across the Americas, could increase the attractiveness of U.S.-based solar manufacturing. Although improvements to standard PV modules have produced deep cost reductions over the past years, the returns on such improvements appear to be diminishing, and more dramatic innovations in module design and manufacturing may be needed to maintain the path of rapid progress while opening further opportunities for domestic manufacturing.

Within the solar manufacturing value chain, module manufacturing represents one of the areas where innovation can be still introduced. Capital expenditures (CapEx) for a new module assembly line is lower relative to other components such as wafers and solar cell, but the process still requires several steps, some of them quite slow (e.g. lamination).

AMO and SETO are looking for new module manufacturing technologies, equipment development, individual process step innovation that can accomplish one or more of the following objectives:

- ~~13.~~ Modifications and repurposing of existing or dormant manufacturing technologies in order to utilize an existing infrastructure and demonstrate synergies with existing or new module technologies;
- ~~14.~~ Reduction of the number of steps in a module assembly (from cells or completed thin film device stack to completed module);
- ~~15.~~ Development of new tools or technologies that will increase the throughput of existing or new processes;
- ~~16.~~ Development of new module assembly technologies, methods and improved form factors that optimize module cost per watt;
- ~~17.~~ Development of module manufacturing methods that enable incorporation of new and upcoming cell technologies such as perovskite or other high efficiency solar cells such as monolithic module manufacturing methods;
- ~~18.~~ Development of new module technologies and equipment that lower the tool footprint or optimizes usage of the factory floor;
- ~~19.~~ Replacement of manufacturing bottlenecks (e.g. lamination, encapsulation) with faster and more efficient processes; and

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- Development of techniques that could allow for the manufacture of mechanically staked or fully integrated tandem technologies.

In the Phase I of these projects, DOE expects applicants to analyze the feasibility of a new technology or process, identify and do preliminary work with relevant stakeholders to ensure easy access to facilities to test, validate, and prototype the new design. A prototype should be developed with the goal to embed or test it in a real-world assembly line or a dormant facility during Phase II.

Questions -- contact solar.sbir@ee.doe.gov and Dickson.Ozokwelu@ee.doe.gov

References:

[1] https://energy.gov/eere/amo
[2] https://energy.gov/solar-office
[3] https://www.energy.gov/eere/solar/goals-solar-energy-technologies-office
[4] https://www.aiche.org/rapid
[5] https://www.duramat.org/capabilities.html
[6] https://www.nrel.gov/docs/fy16osti/65788.pdf

11. JOINT TOPIC: ADVANCED MANUFACTURING AND GEOTHERMAL TECHNOLOGIES OFFICES

Maximum Phase I Award Amount: (b) (5) 200,000	Maximum Phase II Award Amount: (b) (5) $1,100,000
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Geothermal Technologies Office (GTO) focuses on applied research, development, and innovations that will improve the competitiveness of geothermal energy, as to generate high-capacity factor dispatchable electricity, and in direct-use applications for heating and cooling of American homes and businesses. Domestic geothermal energy enables (b) (5)
(b) (5) energy security, resiliency, and a strong domestic economy in emerging technologies [2].

In this Topic, AMO and GTO partner to solicit innovative research and development projects capable of addressing both critical material and critical water issues. This topic supports the priorities of the Acting Assistant Secretary for EERE to address (1) critical water issues: improve long-term access to clean, affordable water supplies, including technical challenges at the nexus of energy and water (energy used to produce clean water and water used in energy production) and identify ways to produce and ensure the availability of water during long term outages; and (2) critical materials: developing technologies to reduce the impediments to domestic critical materials production, finding alternatives to foreign-sourced critical materials, and developing technologies to reuse and recycle critical materials.

The Phase I application should detail design and bench scale systems that are scalable to a subsequent Phase II prototype development. Applications must be responsive to the following subtopic. Applications outside of this area will not be considered.

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to baselines from the EERE Study [3];
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions;
- Include a preliminary cost analysis;
- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Grant applications are sought in the following subtopics:

a. Geothermal Desalination and Critical Material Recovery Systems

Desalination systems take an impaired water source and produce fresh water and a concentrated brine waste stream. A typical source is seawater with approximately 35,000 ppm total dissolved solids (TDS), but other sources can include coal tailing, industrial waters, and produced waters from oil and gas, which have higher TDS. The concentrated brine byproduct is a good target for mineral recovery operations because the critical material(s) of interest will occur in higher concentrations which may improve the economics for their recovery.

To be responsive to this topic, the small business must propose a research and development project that aims to commercialize a system that will accomplish both desalination and recovery of a critical material. For this subtopic, the process must use a geothermal heat source. Specifically, the system must yield fresh water with less than 500 ppm TDS while recovering at least one critical material, which can include, but is not limited to, rare earth elements. A comprehensive list of 35 mineral commodities deemed critical under the definition from Executive Order 13817 was recently published by the Secretary of the Interior [4].

Because the material recovery and water processing scale differently to address their commercial needs, it is recommended that each applicant select a primary goal for their system (i.e., design a critical material recovery system that is capable of treating water or vice versa). The current benchmark for thermal seawater desalination is multi-stage flash whose energy intensity is estimated at 15 kWh per meter cubed with approximately 11 kWh coming from thermal energy [3]; however, more efficient thermal desalination systems are currently under development and energy intensity can vary increase significantly for higher TDS source waters.

Under this subtopic, the system must be tailored to make use of geothermal heat, with low temperature geothermal resources (<150 °C) being of particular interest in this application. These resources can come from lower temperature geothermal reservoirs or from cascaded applications from higher temperature geothermal resources. The impaired water sources primarily of interest in this subtopic are geothermal brines and produced waters from oil and gas.

Questions – contact joshua.mengers@ee.doe.gov

b. Desalination and Critical Material Recovery Systems from Other Energy Sources

In addition to the specific subtopic listed above, the Department also solicits applications that fall within the specific scope of the topic description above. Specifically, this subtopic will allow systems that use energy sources other than geothermal and will focus on systems that propose improvements in energy efficiency by at least 30%. The baseline for current typical energy intensity for seawater desalination is reverse osmosis at 3.3 kWh per cubic meter yielding costs of nearly $2 per cubic meter [3].

Questions – contact Tara.Gonzalez@ee.doe.gov

References:

[1] Advanced Manufacturing Office Website: https://energy.gov/eere/amo
[2] Geothermal Technologies Office Website: https://energy.gov/eere/geothermal
[3] "Bandwidth Study on Energy Use and Potential Energy Savings Opportunities in U.S. Seawater Desalination Systems." EERE Report, October, 2017
https://www.energy.gov/sites/prod/files/2017/12/f46/Seawater_desalination_bandwidth_study_2017.pdf
[4] "Final List of Critical Minerals 2018." Federal Register, Vol. 83, No. 97, May 18, 2018
https://www.gpo.gov/fdsys/pkg/FR-2018-05-18/pdf/2018-10667.pdf

12. JOINT TOPIC: ADVANCED MANUFACTURING AND FUEL CELL TECHNOLOGIES OFFICES

Maximum Phase I Award Amount: (b) (5) $200,000	Maximum Phase II Award Amount: (b) (5) 1,100,000
Accepting SBIR Phase I Applications: YES	Accepting STTR Phase I Applications: YES

The Advanced Manufacturing Office (AMO) collaborates with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States [1].

The Fuel Cells Technologies Office (FCTO) focuses on applied research, development, and innovation to advance hydrogen and fuel cells for transportation and diverse applications enabling energy security, resiliency, and a strong domestic economy in emerging technologies [2].

Applications must:

- Propose a tightly structured program which includes technical milestones that demonstrate clear progress, are aggressive but achievable, and are quantitative;
- Include projections for price and/or performance improvements that are tied to a baseline (i.e. MYPP or Roadmap targets and/or state of the art products or practices);
- Explicitly and thoroughly differentiate the proposed innovation with respect to existing commercially available products or solutions; .
- Include a preliminary cost analysis;

- Justify all performance claims with theoretical predictions and/or relevant experimental data.

Applications must be responsive to the following subtopic. Applications outside of this area will not be considered.

Applications are sought in the following subtopic:

a. Advanced Materials for Detection and Removal of Impurities in Hydrogen

High-performance membrane technologies have been explored in recent years for their potential to detect and remove contaminants from streams of hydrogen gas, to serve applications requiring high purities (e.g. petroleum refineries, glassmaking plants or hydrogen fueling stations) [3]. Today, the primary approaches to management of contamination are: (1) ~~the use~~ pressure swing adsorption techniques at centralized hydrogen production facilities, and (2) ~~design of~~ distribution infrastructure technologies to mitigate the introduction of contaminants. Nevertheless, excursions can take place~~;~~ ~~examples~~ Examples of sources of potential contamination include lubricating oil in compressors, off-gassing from polymers, or residual water from steam methane reformers or electrolysis [3]. Contaminants can permanently deactivate catalysts (e.g. within upgrading equipment at refineries, or in fuel cells onboard vehicles). Current inline detectors at hydrogen filling stations for fuel cell vehicles are incapable of removing contaminants, or shutting down a dispenser in time to prevent them from reaching the vehicle.

This subtopic seeks concepts that can both detect and remove high-priority contaminants from hydrogen fuel. Concepts proposed should be capable of continuous operation at 875 bar and -40°C, such that the unit developed can be installed immediately upstream of a hydrogen dispenser. Contaminants of particular interest, based on their likelihood of occurrence and the level of damage they can do to a fuel cell, are: water, carbon monoxide, total sulfur, ammonia, and total hydrocarbons [4]. Phase I of proposed projects should develop and evaluate potential materials that are capable of removing water, carbon monoxide, sulfur, and hydrocarbons from hydrogen fuel at stations to SAE J2719 levels [5], and design a concept that can both detect and remove contaminants. The designed system should be easily removable and replaceable once the expected lifetime expires. Concepts proposed should target a capital cost of <$5,000 and an annual operating cost of (b) (5) $1,100. Phase II may include the development and experimental evaluation of a prototype.

Questions – contact neha.rustagi@ee.doe.gov and tara.gonzalez@ee.doe.gov

References:
[1] https://energy.gov/eere/amo
[2] https://www.energy.gov/eere/fuelcells/fuel-cell-technologies-office
[3] https://www.energy.gov/sites/prod/files/2015/04/f21/fcto_2014_hcd_workshop_1_report.pdf
[4] https://www.nrel.gov/docs/fy15osti/64063.pdf
[5] https://www.sae.org/standards/content/j2719_201109/