Rodriguez, Susan (CONTR)

From: Nilsen, Garrett
Sent: Monday, March 26, 2018 2:20 PM
To: Fricker, Kyle;Kane, Victor;Ferguson, Jamal (CONTR);Yuan, Guohui;Tinker, Lenny;Shultz, Avi;Ulrich, Elaine
Cc: Olson, Dana;Rench-McCauley, Dave (FELLOW);Bauer, Matthew (CONTR);Goldstone, Michael;Miller, Jeremiah;Gay, Charlie;Jones-Albertus, Becca;Mikrut, Jeremey;Walter, David
Subject: RE: FY'18 FOA Strategy Meeting

Adding Dave Walter to the list so he can help with FOA logistics and learn the process.

Kyle what you mention below makes sense although that will be a very tight turn around on the concept papers. My concern is compounded by the fact that some teams will have other efforts going in parallel (CSP and SI FOAs, Prize, etc).

Kyle, could I ask you to tag up with each of the PMs to get there timelines for each of the efforts they have going right now and put them in a single spreadsheet so we can see what is going on each month? Would you be able to do that by Thursday so we can discuss office workload over the coming months at the PM offsite Friday?

Let me know if you think it will be an issue for you to do this (b) (6) you have the most visibility into the FOA/Prize and the other teams should have a feel for where they are.

In short, I think each effort alone is possible, but (b) (5)

Thanks!

Garrett Nilsen
Program Manager, Technology to Market
Acting Program Manager, Soft Costs

Solar Energy Technologies Office
U.S. Department of Energy
(202) 287-1676 Office
(b) (6) Cell
Garrett.Nilsen@ee.doe.gov

From: Fricker, Kyle
Sent: Monday, March 26, 2018 10:47 AM
To: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Ferguson, Jamal (CONTR) <Jamal.Ferguson@ee.doe.gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>; Nilsen, Garrett <Garrett.Nilsen@ee.doe.gov>; Tinker, Lenny <Lenny.Tinker@ee.Doe.Gov>; Shultz, Avi <Abraham.Shultz@EE.Doe.Gov>; Ulrich, Elaine <Elaine.Ulrich@ee.Doe.Gov>
Cc: Olson, Dana <Dana.Olson@Hq.Doe.Gov>; Rench-McCauley, Dave (FELLOW) <Dave.Rench-McCauley@ee.doe.gov>; Bauer, Matthew (CONTR) <Matthew.Bauer@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>; Miller, Jeremiah <Jeremiah.Miller@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Mikrut, Jeremey <Jeremey.Mikrut@ee.doe.gov>
Subject: RE: FY'18 FOA Strategy Meeting

One thing to note is that our concept paper (CP) review will have to be pretty fast. With CPs coming in on April 26, we should be able to assign for review by May 1 (accounting for compliance review and meeting with GFO). In order to have full apps (FAs) come in by June 21, we need to release encourage/discourage decisions by May 24 to give them 4 weeks for FA writing. That leave us 16 business days to review CPs, make decisions, and brief SO.

I think this timeline is feasible but it will be tough so I wanted to flag it. I guess we can revisit this timeline once more once we have the actual release date locked in.

Best,
Kyle

From: Kane, Victor
Sent: Thursday, March 22, 2018 1:40 PM
To: Ferguson, Jamal (CONTR) <Jamal.Ferguson@ee.doe.gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>; Nilsen, Garrett <Garrett.Nilsen@ee.doe.gov>; Tinker, Lenny <Lenny.Tinker@ee.Doe.Gov>; Shultz, Avi <Abraham.Shultz@EE.Doe.Gov>; Ulrich, Elaine <Elaine.Ulrich@ee.Doe.Gov>
Cc: Olson, Dana <Dana.Olson@Hq.Doe.Gov>; Rench-McCauley, Dave (FELLOW) <Dave.Rench-McCauley@ee.doe.gov>; Hott, Rebecca (CONTR) <Rebecca.Hott@ee.doe.gov>; Bauer, Matthew (CONTR) <Matthew.Bauer@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Miller, Jeremiah <Jeremiah.Miller@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Mikrut, Jeremey <Jeremey.Mikrut@ee.doe.gov>; Dave Rench McCauley <drench56@gmail.com>
Subject: RE: FY'18 FOA Strategy Meeting

Hi All, here is a draft timeline table assuming a March 29th FOA release date. I based it off of the schedule we had created together in a previous meeting. Please let me know if you think if should be adjusted.

Best,
Victor

FOA Issue Date:	March 29th, 2018
Submission Deadline for Letter of Intent (LOI):	April 19th, 2018, 3:00pm ET
Informational Webinar: Visit EERE exchange FOA description for details regarding webinar timing and registration	
Submission Deadline for Concept Papers: • Applicants must submit a Concept Paper by 3:00pm ET on the due date listed above to be eligible to submit a Full Application. Topic Areas 2.1 and 3.1 SIPS applications must resubmit their LOI again as a concept paper by the concept paper deadline above to clear an administrative software restriction of EERE Exchange.	April 26th, 2018, 3:00pm ET
Submission Deadline for Full Applications and SIPS Applications:	June 21st, 2018, 3:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	July 26th, 2018, 3:00pm ET
Expected Timeframe for EERE Selection Notifications:	September 2018

From: Kane, Victor
Sent: Thursday, March 22, 2018 12:04 PM

To: Ferguson, Jamal (CONTR) <Jamal.Ferguson@ee.doe.gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>; Nilsen, Garrett <Garrett.Nilsen@ee.doe.gov>; Tinker, Lenny <Lenny.Tinker@ee.Doe.Gov>; Shultz, Avi <Abraham.Shultz@EE.Doe.Gov>; Ulrich, Elaine <Elaine.Ulrich@ee.Doe.Gov>
Cc: Olson, Dana <Dana.Olson@Hq.Doe.Gov>; Rench-McCauley, Dave (FELLOW) <Dave.Rench-McCauley@ee.doe.gov>; Hott, Rebecca (CONTR) <Rebecca.Hott@ee.doe.gov>; Bauer, Matthew (CONTR) <Matthew.Bauer@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Miller, Jeremiah <Jeremiah.Miller@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Mikrut, Jeremey <Jeremey.Mikrut@ee.doe.gov>; Dave Rench McCauley <drench56@gmail.com>
Subject: RE: FY'18 FOA Strategy Meeting

Hi All, as a last step for the FOA we need to decide how we would like to display the funding by topic and number of awards. I began to write it out in paragraph form and it became hard to follow. Can you please review the below and come to the 1pm meeting today to determine how we should display the information?

Best,
Victor

I. Award Information

A. Award Overview

i. Estimated Funding

EERE expects to make awards based on the guidance provided in the below table (subject to the availability of appropriated funds). The cells are structured to show:

- The expected total amount of funding allocated for the subtopic
  - Note: The actual funding numbers per subtopic may be somewhat higher or lower depending on the number and quality of applications within each subtopic
- The average expected amount for an individual award within that subtopic
  - Note: Individual award amounts may be somewhat higher or lower than the expected amount depending on the scope of the project
- The expected award duration for a project within that subtopic
  - Note: Depending on the scope of the proposed project, some projects may have shorter durations, and in rare cases, longer durations
- The expected number of awards that could be made for the subtopic
  - Note: The actual number of awards per subtopic will depend on the number and quality of applications within each subtopic

	Topic Title	Details ($105M in total funding)
TOPIC 1: Adaptive Local Grids, Advanced Systems Integration Technologies (20% cost share, TRL 2-5)		
Topic 1.1	Adaptive Local Grids	~$18M ~$4.5M/award ~3 years ~4 awards
Topic 1.2	Solar Observability	~$18M ~$3M/award ~3 years ~4 awards
Topic 1.3	Solar + X	
Topic 1.4	Innovative Pathways:	~$2M

	Systems Integration	~$1M/award ~3 years ~2 awards
Topic 2: Concentrating Solar Power Research and Development (20% cost share, TRL 2-5)		
Topic 2.1	Small Innovative Projects in Solar (SIPS): Concentrating Solar Power	~$5M ~$300k/award ~1.5 years ~17 awards
Topic 2.2	Advanced CSP Collectors	~$34M total ~$2M/award ~3 years ~17 awards
Topic 2.3	Advanced Power Cycles for CSP	
Topic 2.4	Advanced CSP Thermal Transport System and Components	
Topic 2.5	Innovative Pathways: Concentrating Solar Power	~$1M ~$1M/award ~3 years ~1 award
Topic 3: Photovoltaics Research and Development (20% cost share, TRL 2-5)		
Topic 3.1	Small Innovative Projects in Solar (SIPS): Photovoltaics	~$2M ~$200k/award ~1.5 years ~10 awards
Topic 3.2	Increasing Affordability, Reliability, and Manufacturability of PV Cells, Modules, and Systems	~$15M ~$1.5M/award ~3 years ~10 awards
Topic 3.3	Collaborative Cross-Cutting PV Research	
Topic 3.4	Innovative Pathways: Photovoltaics	$2M ~$1M/award ~3 years ~2 awards
Topic 4: Improving and Expanding the Solar Industry through Workforce Initiatives (No cost share, Education and Outreach)		
Topic 4.1	Increasing Inclusion in the Solar Workforce	~$2M ~$1M/award ~3 years ~2 awards
Topic 4.2	Digital Adaptation in Power Systems through Workforce Initiatives	~$6M ~$3M/award ~5 years ~2 awards

-----Original Appointment-----
From: Ferguson, Jamal (CONTR)
Sent: Thursday, August 24, 2017 12:33 PM
To: Ferguson, Jamal (CONTR); Yuan, Guohui; Nilsen, Garrett; Kane, Victor; Tinker, Lenny; Shultz, Avi; Ulrich, Elaine
Cc: Olson, Dana; Rench-McCauley, Dave (FELLOW); Hott, Rebecca (CONTR); Bauer, Matthew (CONTR); Goldstone, Michael; Fricker, Kyle; Miller, Jeremiah; Gay, Charlie; Jones-Albertus, Becca; Mikrut, Jeremey; Dave Rench McCauley
Subject: FY'18 FOA Strategy Meeting
When: Thursday, March 22, 2018 1:30 PM-2:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: 6075

Topic: **Discuss FY'18 FOA strategies**
Required Attendees: **PM and/or team delegate selected by PM**

DO NOT DELETE OR CHANGE ANY OF THE TEXT BELOW THIS LINE*******
WebEx information for your meeting scheduled on https://meetings.doe.gov/meetings will replace this section after you save and send this invitation.
DO NOT DELETE OR CHANGE ANY OF THE TEXT BELOW THIS LINE

Jamal Ferguson has scheduled this WebEx meeting.

FY'18 FOA Strategy Meeting
Host: Jamal Ferguson

When it's time, start or join the WebEx meeting from here:
https://meetings.doe.gov/orion/joinmeeting.do?MTID=0956d342ca6eaa61049164588c63fa03

Access Information

Meeting Number: (b) (6)
Meeting Password: (b) (6)

Audio Connection

240-562-2222 (DOE)

Access Code:
(b) (6)

Hosts, need your host access code or key? Go to the meeting information page:
https://meetings.doe.gov/orion/meeting/meetingInfo?MTID=a46d04c4ea54366f2cc638201b7becab

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Rodriguez, Susan (CONTR)

From: Yuan, Guohui
Sent: Monday, March 26, 2018 6:50 PM
To: Shultz, Avi;Nilsen, Garrett;Vauss, Ebony;Gay, Charlie;Jones-Albertus, Becca;Tinker, Lenny;Ulrich, Elaine
Subject: RE: Scenario Planning.xlsx
Attachments: Copy of Scenario Planning_CSP_BOS_T2M_mod_SI.xlsx

I populated the SI section. The only change is to correct the number allocated for SI topics in the FY18 FOA, $36M (b) (5)

Guohui

-----Original Message-----
From: Shultz, Avi
Sent: Monday, March 26, 2018 5:19 PM
To: Nilsen, Garrett <Garrett.Nilsen@ee.doe.gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Tinker, Lenny <Lenny.Tinker@ee.Doe.Gov>; Ulrich, Elaine <Elaine.Ulrich@ee.Doe.Gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Subject: RE: Scenario Planning.xlsx

To simplify things for everyone, I edited Garrett's sheet a little - (b) (5) to make it easier to keep track.

-----Original Message-----
From: Nilsen, Garrett
Sent: Monday, March 26, 2018 5:09 PM
To: Shultz, Avi <Abraham.Shultz@EE.Doe.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Tinker, Lenny <Lenny.Tinker@ee.Doe.Gov>; Ulrich, Elaine <Elaine.Ulrich@ee.Doe.Gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Subject: RE: Scenario Planning.xlsx

Hi Everyone,

Attached are my additions to Avi's sheet.

(b) (5) Please let me know if this is off.

BOS
(b) (5)

- In BOS I did add a line item for adding more funds to some ongoing efforts. (b) (5)

This may be our only chance to further these efforts. (b) (5)
(b) (5) I am open to suggestions.

T2M
(b) (5)

I think we will see some solutions be proposed in particular to th PV topics.

(b) (5) I think we can use this as a flexible line to absorb excess funds, if there are any...

(b) (5) on catalyst to ensure the Prize has enough funding to do at least 3 full rounds. This can also be added to if we want to extend runway or potentially make larger rounds in the future, depending how this first one goes of course.

-Finally, T2M number (b) (5)

Please let me know if you have any questions. I am at a conference tomorrow, but can be available except from 2-4 when I will be on a panel.

Garrett Nilsen
Program Manager, Technology to Market
Acting Program Manager, Soft Costs

Solar Energy Technologies Office
U.S. Department of Energy
(202) 287-1676 Office
(b) (6) Cell
Garrett.Nilsen@ee.doe.gov

-----Original Message-----
From: Shultz, Avi
Sent: Monday, March 26, 2018 4:33 PM
To: Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Nilsen, Garrett <Garrett.Nilsen@ee.doe.gov>; Tinker, Lenny <Lenny.Tinker@ee.Doe.Gov>; Ulrich, Elaine <Elaine.Ulrich@ee.Doe.Gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Subject: RE: Scenario Planning.xlsx

All,

Following our conversation at the PM meeting I took a stab at Charlie's request for CSP. A couple notes:
(b) (5)

(b) (5)

-These two items bumped up the total CSP subprogram funding to $62.8 M. I've highlighted my additions to Ebony's spreadsheet in green in the attached.

Avi

-----Original Message-----
From: Vauss, Ebony
Sent: Monday, March 26, 2018 2:07 PM
To: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Nilsen, Garrett <Garrett.Nilsen@ee.doe.gov>; Shultz, Avi <Abraham.Shultz@EE.Doe.Gov>; Tinker, Lenny <Lenny.Tinker@ee.Doe.Gov>; Ulrich, Elaine <Elaine.Ulrich@ee.Doe.Gov>; Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Subject: Scenario Planning.xlsx

For Discussion at PM meeting.

Best,

Ebony

	Proposed Distribution of additional resources							
	(b) (5)							
CSP		$ 55,000,000	$ 54,000,000	$ 48,000,000	$ 11,000,000	$ 12,500,000	$ 8,000,000	
FY18 SETO FOA			$ 35,000,000	$ 30,000,000	$ 3,000,000	$ 3,000,000		
Desalination		6,000,000.00						
Additional Gen3 Funds			$ 5,600,000	$ 5,200,000				
SuNLaMP + FY19 Forward Funding			$ 8,000,000	$ 8,000,000	$ 7,000,000	$ 7,000,000	$ 7,000,000	
Analysis								
PM			$ 5,400,000	$ 4,800,000	$ 1,000,000	$ 2,500,000	$ 1,000,000	
PV		$ 70,000,000	$ 62,000,000	$ 48,000,000	$ 41,000,000	$ 41,900,000	$ 38,681,990	
FY18 SETO FOA			$ 20,300,000	$ 10,700,000	$ 2,000,000	$ 3,000,000		
SuNLaMP + FY19 Forward Funding			$ 27,000,000	$ 25,000,000	$ 23,500,000	$ 23,200,000	$ 23,181,990	
DuraMat			$ 6,000,000	$ 5,000,000	$ 5,000,000	$ 5,000,000	$ 5,000,000	
Analysis								
QESST			$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 2,500,000	
PM			$ 6,200,000	$ 4,800,000	$ 8,000,000	$ 8,200,000	$ 8,000,000	
SI		$ 45,000,000	$ 55,000,000	$ 45,000,000	$ 24,700,000	$ 28,700,000	$ 18,000,000	
FY18 SETO FOA			$ 24,500,000	$ 18,500,000	$ 5,000,000	$ 5,000,000	$ 2,000,000	
SuNLaMP + FY19 Forward Funding			$ 15,000,000	$ 15,000,000	$ 15,000,000	$ 15,000,000	$ 15,000,000	
GMLC			$ 10,000,000	$ 7,000,000	$ 3,000,000	$ 3,000,000		
Analysis								
PM			$ 5,500,000	$ 4,500,000	$ 1,700,000	$ 5,700,000	$ 1,000,000	
BOS		$ 10,500,000	$ 15,000,000	$ 10,500,000	$ 6,000,000	$ 6,800,000	$ -	
FY18 SETO FOA (also has $1M of FY17 funds)			$ 7,000,000	$ 6,750,000	$ 3,000,000	$ 3,000,000		
SuNLaMP + FY19 Forward Funding for Analysis			$ 3,000,000	$ 2,750,000	$ 2,000,000	$ 2,500,000	$ 2,000,000	In PV budget request
PM			$ 1,500,000	$ 1,000,000		$ 1,300,000		
Top Up Ongoing Work (SEIN, SolSmart, etc)								
Catalyst			$ 3,500,000					
TTM		$ 21,000,000	$ 16,000,000	$ 16,000,000	$ 9,000,000	$ 10,100,000	$ -	
SBIR			$7,373,000	$6,113,750	$3,285,000	$ 4,340,000	$ 2,390,710	In PV budget request
FY18 SETO FOA			$5,209,000	$3,778,750	$1,000,000			
Beyond Batteries								
TCF			$1,818,000	$1,507,500	$810,000	$ 900,000	$ 627,300	In PV budget request
Catalyst				$3,000,000	$ 3,000,000	$ 3,000,000		
PM			$ 1,600,000	$ 1,600,000	$ 205,000	$ 1,860,000		
Sum (check)		$ 201,500,000	$ 198,500,000	$ 167,500,000	$ 90,000,000	$ 100,000,000	$ 69,700,000	
Check		$ 241,600,000						
Unallocated		$ (40,100,000)						

Rodriguez, Susan (CONTR)

From: Fitzsimmons, Alexander
Sent: Wednesday, March 28, 2018 12:44 PM
To: Varnasidis, Sophia
Cc: Simmons, Daniel
Subject: RE: FY18 FOA review for S3

Sounds good. Thank you for the update, Sophia.

From: Varnasidis, Sophia <Sophia.Varnasidis@hq.doe.gov>
Date: Wednesday, Mar 28, 2018, 9:05 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: RE: FY18 FOA review for S3

Alex,
(b) (5)

Thanks
Sophia

From: Fitzsimmons, Alexander
Sent: Wednesday, March 28, 2018 10:37 AM
To: Varnasidis, Sophia <Sophia.Varnasidis@hq.doe.gov>
Subject: FY18 FOA review for S3

Hi Sophia,

Does S3 want to review our FY18 FOAs? Our program offices are adjusting their spend plans based on the new budget numbers. Daniel and I will get a full report by COB Friday and will be briefed by our DASs on their proposals early next week.

Best,

Alex

Rodriguez, Susan (CONTR)

From: Singsen, Jeannette
Sent: Thursday, April 05, 2018 7:06 AM
To: Tirado, Christopher;Funding Opportunity Announcement (FOA)
Cc: Jacob, Bindu;Peralta, Kara Houston;Schneir, Sydney;Pezzullo, Leslie
Subject: RE: Weekly Update - Financial Assistance Work Plans
Attachments: Work Plan for Approved FY17 FOA's - EERE 4-4-2018.xlsx

Hi Chris,

Thank you for the extension on EERE's FY18 FOA plan submission. In the meantime, attached please find EERE's updated FY17 work plan for this week (one update on row 34).

Jeannette Singsen
Phone: 240-562-1782

-----Original Message-----
From: Tirado, Christopher
Sent: Thursday, April 05, 2018 7:36 AM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: RE: Weekly Update - Financial Assistance Work Plans

Hi Jeannette,

Is it possible to still receive the previous version of the plan if there are updates? If not, or if there are no updates, I will just be on the lookout for the updated version in the next couple of weeks.

Thank you,
Chris

-----Original Message-----
From: Singsen, Jeannette
Sent: Wednesday, April 04, 2018 4:22 PM
To: Tirado, Christopher <Christopher.Tirado@Hq.Doe.Gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: RE: Weekly Update - Financial Assistance Work Plans

Hi Chris,

May we request an extension for the updated work plan submissions until our FY18 plan is finalized? We are likely 1 to 2 weeks out from finalizing our plan.

EERE received a 14% increase over FY17 Enacted and we are doing a full review of FOA plans with EERE leadership. At this point, decisions are still pending with EERE leadership.

Thank you!

Jeannette

Phone: 240-562-1782

-----Original Message-----
From: Funding Opportunity Announcement (FOA)
Sent: Tuesday, April 03, 2018 8:43 AM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Subject: RE: Weekly Update - Financial Assistance Work Plans

Hi Jeanette,

Now that the budget has been passed, is it possible to get the actual amounts that each FOA is estimated to receive (vs. the estimated House, Senate, CR marks used before)?

Thank you,
Chris

-----Original Message-----
From: Singsen, Jeannette
Sent: Wednesday, March 21, 2018 5:42 PM
To: Tirado, Christopher <Christopher.Tirado@Hq.Doe.Gov>; Funding Opportunity Announcement (FOA) <FOA@hq.doe.gov>
Cc: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>; Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>; Schneir, Sydney <Sydney.Schneir@EE.Doe.Gov>; Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Subject: Weekly Update - Financial Assistance Work Plans

Attached please find EERE's updated work plans for this week.

Thank you,

Jeannette Singsen

Project Management Coordination Office (PMCO)

Office of Energy Efficiency and Renewable Energy

U.S. Department of Energy

Phone: 240-562-1782

Rodriguez, Susan (CONTR)

From: Peralta, Kara Houston
Sent: Thursday, June 21, 2018 11:33 AM
To: Tirado, Christopher
Cc: Jacob, Bindu;Pezzullo, Leslie;Singsen, Jeannette;Wozniak, Genevieve
Subject: EERE FY18 Financial Assistance Funding

Chris,

Below please find the numbers you requested from EERE. The numbers represent the total planned amount for FOAs approved as part of the FY18 FOA process, no matter the year of the funding.

Please note: Some of these FOAs utilize funding from prior years (e.g., FY17, FY16). That information was included in the MA FOA Cover Sheets provided as part of the FY18 review/approval process.

Please feel free to reach out if you have questions or need anything additional.

Actions Reviewed through FY18 MA Process	Total DOE $
FOA	$443,385,000
ALRD	$286,500,000
FOA and ALRD Total	**$739,885,000**

Thanks,
Kara

Kara H. Peralta
Acting Director, Office of Business Operations
Energy Efficiency and Renewable Energy
U.S. Department of Energy
KaraHouston.Peralta@ee.doe.gov
O: 202.586.8925 M:(b) (6)

Federal Investment in EERE Selections (since April)

State	FOA Name	Recipient Name	Total
AK	Alternate Selections from: Marine and Hydrokinetic (MHK) Technology Development and Advancement	University of Alaska Fairbanks	$1,000,000
	Alternate Selections from: Next Generation Marine Energy Systems, Durability and Survivability. Topic Area 2	Igiugig Village Council	$2,320,000
AK Total			$3,320,000
AR	Advanced Power Electronics Design for Solar Applications	University of Arkansas	$2,765,138
AR Total			$2,765,138
AZ	EERE SBIR/STTR Phase I, Release 2 Selections	Local Motors	$150,000
AZ Total			$150,000
CA	Advanced Power Electronics Design for Solar Applications	Flex Power Control, Inc.	$2,496,150
	EERE SBIR/STTR Phase I, Release 2 Selections	Cuberg, Inc	$150,000
		Global Algae Innovations, Inc.	$150,000
		Industrial Microbes, Inc.	$150,000
		InnoSense LLC	$150,000
		Intertie Incorporated	$150,000
		Lygos	$150,000
		MicroBio Engineering	$150,000
		Operant Solar	$150,000
		Physical Optics Corporation	$300,000
		Porifera Inc.	$150,000
		Sunvapor Inc	$150,000
		Traffic Worx LLC (dba Xtelligent)	$150,000
		Vistar Energy	$150,000
	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	Delta Products Corporation	$3,499,962
		Regents of the University of California, University of California San Diego	$653,641
		SLAC National Accelerator Laboratory	$1,500,000
	Generation 3 Concentrating Solar Power Systems	Electric Power Research Institute, Inc.	$1,499,901

CA	Generation 3 Concentrating Solar Power Systems (Alternates)	University of California San Diego	$1,180,000
CA Total			**$12,929,654**
CO	Advanced Power Electronics Design for Solar Applications	National Renewable Energy Laboratory	$1,000,000
	EERE SBIR/STTR Phase I, Release 2 Selections	ADA Technologies, Inc.	$150,000
		Hazen Research, Inc.	$150,000
		JC Solutions LLC	$150,000
		TDA Research, Inc.	$600,000
	Generation 3 Concentrating Solar Power Systems	National Renewable Energy Laboratory	$7,035,309
CO Total			**$9,085,309**
CT	EERE SBIR/STTR Phase I, Release 2 Selections	3D Array Technology LLC	$150,000
		Energy Analytics LLC	$150,000
	Fuel Cell Technologies H2 Production Alternate Selections	FuelCell Energy	$1,500,000
CT Total			**$1,800,000**
DE	EERE SBIR/STTR Phase I, Release 2 Selections	Compact Membrane Systems, Inc.	$150,000
		EA Membranes LLC	$150,000
		RiKarbon, Inc.	$150,000
DE Total			**$450,000**
FL	EERE SBIR/STTR Phase I, Release 2 Selections	Mainstream Engineering Corporation	$150,000
	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	Microvast, Inc.	$1,500,000
FL Total			**$1,650,000**
GA	Advanced Power Electronics Design for Solar Applications	Georgia Institute of Technology	$1,927,973
	Generation 3 Concentrating Solar Power Systems	Georgia Institute of Technology	$3,318,635
GA Total			**$5,246,608**
HI	EERE SBIR/STTR Phase I, Release 2 Selections	Global Algae Innovations, Inc	$150,000
		Global Algae Innovations, Inc.	$150,000
HI Total			**$300,000**
IA	EERE SBIR/STTR Phase I, Release 2 Selections	Sep-All LLC	$150,000

IA Total			**$150,000**
ID	**Advanced Power Electronics Design for Solar Applications**	Idaho National Laboratory	$1,000,000
	EERE SBIR/STTR Phase I, Release 2 Selections	Idaho Scientific	$150,000
ID Total			**$1,150,000**
IL	**Biomass Research and Development Initiative (BRDI)**	Northwestern University	$1,600,000
	EERE SBIR/STTR Phase I, Release 2 Selections	Beltech	$150,000
		Emergy LLC	$150,000
		GARD Analytics	$150,000
		QCoefficient, Inc.,	$150,000
IL Total			**$2,200,000**
IN	**EERE SBIR/STTR Phase I, Release 2 Selections**	Indiana Tool & Mfg. Co., Inc.	$150,000
		Magnetic Power-Motion, LLC	$150,000
	Generation 3 Concentrating Solar Power Systems	Purdue University	$1,960,745
IN Total			**$2,260,745**
KY	**EERE SBIR/STTR Phase I, Release 2 Selections**	Blake-Philips	$150,000
KY Total			**$150,000**
MA	**EERE SBIR/STTR Phase I, Release 2 Selections**	Boston Electrometallurgical Corporation	$150,000
		CAMX Power LLC	$150,000
		Polnox Corporation	$150,000
		Triton Systems, Inc.	$150,000
		Xilectric	$150,000
	Fuel Cell Technologies H2 Production Alternate Selections	Saint-Gobain Ceramics & Plastics, Inc.	$967,026
	Generation 3 Concentrating Solar Power Systems	Massachusetts Institute of Technology	$1,771,798
	Generation 3 Concentrating Solar Power Systems (Alternates)	Massachusetts Institute of Technology	$1,932,414
	Innovative Solutions for Fish Passage at Hydropower Dams	Alden Research Laboratory, Inc.	$799,999
		University of Massachusetts Amherst	$318,127
	Alternate Selections from: Marine and Hydrokinetic (MHK) Technology Development and Advancement	ENORASY LLC	$755,000
		Resolute Marine Energy, Inc.	$999,853
MA Total			**$8,294,217**

MD	Advanced Power Electronics Design for Solar Applications	University of Maryland: College Park	$1,872,818
	EERE SBIR/STTR Phase I, Release 2 Selections	Accustrata, Inc.	$150,000
		Inventwood LLC.	$150,000
		Ladybug Tools LLC	$150,000
MD Total			**$2,322,818**
ME	EERE SBIR/STTR Phase I, Release 2 Selections	Introspective Systems LLC	$150,000
	Innovative Solutions for Fish Passage at Hydropower Dams	Black Bear Hydro Partners, LLC: Brookfield Renewables	$800,000
	Alternate Selections from: Marine and Hydrokinetic (MHK) Technology Development and Advancement	ORPC Solutions	$636,699
ME Total			**$1,586,699**
MI	EERE SBIR/STTR Phase I, Release 2 Selections	Navitas Advanced Solutions Group, LLC	$150,000
	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	Regents of the University of Michigan	$1,500,000
MI Total			**$1,650,000**
MN	EERE SBIR/STTR Phase I, Release 2 Selections	Macchina, LLC	$150,000
		SarTec Corporation	$150,000
		Smart Information Flow Technologies	$150,000
		TerraCOH Inc	$150,000
	Alternate Selection for Energy Efficiency R&D for Fluid-Power Systems in Off-Road Vehicles	Regents of the University of Minnesota	$1,504,680
MN Total			**$2,104,680**
MT	EERE SBIR/STTR Phase I, Release 2 Selections	Glacigen Materials, Inc.	$150,000
MT Total			**$150,000**
NC	Advanced Power Electronics Design for Solar Applications	North Carolina State University	$1,517,146
	EERE SBIR/STTR Phase I, Release 2 Selections	Intelli-Products Inc.	$150,000
NC Total			**$1,667,146**

NH	Generation 3 Concentrating Solar Power Systems	Brayton Energy, LLC	$7,570,647
	Generation 3 Concentrating Solar Power Systems (Alternates)	Brayton Energy, LLC	$1,181,603
NH Total			$8,752,250
NJ	EERE SBIR/STTR Phase I, Release 2 Selections	Ashwin-ushas Corporation	$150,000
NJ Total			$150,000
NM	Advanced Power Electronics Design for Solar Applications	Sandia National Laboratories	$1,031,070
	Generation 3 Concentrating Solar Power Systems	Sandia National Laboratories	$9,464,755
NM Total			$10,495,825
NV	EERE SBIR/STTR Phase I, Release 2 Selections	Covalent	$150,000
NV Total			$150,000
NY	EERE SBIR/STTR Phase I, Release 2 Selections	ecoLong LLC	$150,000
		LCDrives Corp.	$150,000
		Maalka	$150,000
		OLEDWorks LLC	$150,000
	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	Research Foundation for the State University of New York - Stony Brook University	$800,000
	Generation 3 Concentrating Solar Power Systems	Mohawk Innovative Technology, Inc.	$1,258,629
	Generation 3 Concentrating Solar Power Systems (Alternates)	Rensselaer Polytechnic Institute	$1,799,892
	U.S. Offshore Wind Research and Development Consortium FOA	New York State Energy Research and Development Authority (NYSERDA)	$18,500,000
NY Total			$22,958,521
OH	EERE SBIR/STTR Phase I, Release 2 Selections	Acme Express, Inc.	$150,000
		Asymmetric Technologies	$150,000
		Biena Tech LLC	$150,000
		Bio-Missions LLC	$150,000
		Faraday Technology, Inc.	$300,000
		Tech4Imaging LLC	$150,000
	Generation 3 Concentrating Solar Power Systems (Alternates)	Powdermet Inc.	$1,326,384

OH Total			**$2,376,384**
OK	Generation 3 Concentrating Solar Power Systems	University of Tulsa	$1,515,687
OK Total			**$1,515,687**
OR	EERE SBIR/STTR Phase I, Release 2 Selections	Voxtel, Inc.	$150,000
OR Total			**$150,000**
PA	EERE SBIR/STTR Phase I, Release 2 Selections	BuildSimHub Inc.	$150,000
		Christian Schafmeister	$150,000
		Media and Process Technology Inc	$150,000
	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	Pennsylvania State University	$1,000,000
PA Total			**$1,450,000**
RI	EERE SBIR/STTR Phase I, Release 2 Selections	Aquanis, Inc.	$150,000
		Prisere LLC	$150,000
RI Total			**$300,000**
SC	Advanced Power Electronics Design for Solar Applications	Savannah River National Laboratory	$1,000,000
	EERE SBIR/STTR Phase I, Release 2 Selections	Tetramer Technologies, L.L.C.	$300,000
SC Total			**$1,300,000**
TN	Advanced Power Electronics Design for Solar Applications	Oak Ridge National Laboratory	$8,755,000
	Biomass Research and Development Initiative (BRDI)	The University of Tennessee	$1,400,000
	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	Coulometrics, LLC	$1,000,000
		Oak Ridge National Laboratory	$3,107,901
		University of Tennessee: Knoxville	$720,000
	Innovative Solutions for Fish Passage at Hydropower Dams	Electric Power Research Institute, Inc.	$449,920
TN Total			**$15,432,821**

TX	Advanced Power Electronics Design for Solar Applications	University of Texas at Austin	$2,999,400
	EERE SBIR/STTR Phase I, Release 2 Selections	Electroninks, Inc	$150,000
TX Total			**$3,149,400**
UT	EERE SBIR/STTR Phase I, Release 2 Selections	InnoSys, Inc.	$150,000
	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	Wireless Advanced Vehicle Electrification	$4,292,137
UT Total			**$4,442,137**
VA	Advanced Power Electronics Design for Solar Applications	Virginia Polytechnic Institute and State University	$1,031,317
	EERE SBIR/STTR Phase I, Release 2 Selections	BEM Controls	$150,000
		Fend, LLC	$150,000
		Golden Analytics LLC	$150,000
		Luna Innovations Incorporated	$150,000
		Strategic Analysis, Inc.	$150,000
VA Total			**$1,781,317**
VT	Generation 3 Concentrating Solar Power Systems	Hayward Tyler, Inc.	$2,000,000
VT Total			**$2,000,000**
WA	Advanced Power Electronics Design for Solar Applications	University of Washington	$2,837,106
	EERE SBIR/STTR Phase I, Release 2 Selections	Artesion, Inc.	$150,000
		Molecule Works Inc.	$150,000
	Alternate Selections from: Marine and Hydrokinetic (MHK) Technology Development and Advancement	Oscilla Power, Inc.	$992,668
WA Total			**$4,129,774**
WI	EERE SBIR/STTR Phase I, Release 2 Selections	SafeLi	$150,000
WI Total			**$150,000**
WV	Fuel Cell Technologies H2 Production Alternate Selections	West Virginia University Research Corporation	$996,835
WV Total			**$996,835**

WY	**EERE SBIR/STTR Phase I, Release 2 Selections**	Resono Pressure Systems LLC	$150,000
WY Total			**$150,000**
Grand Total			**$143,213,965**

Rodriguez, Susan (CONTR)

From: Kane, Victor
Sent: Wednesday, April 11, 2018 12:47 PM
To: DL-EERE-4S (OFC) Solar Energy All
Subject: SETO FY18 FOA Schedule

Hi All,

There is a big push to get the FY18 SETO FOA out on Monday and an interest in scheduling the process so we can obligate FY18 funds before the end of the fiscal year. Below is my understanding of the schedule the FOA team worked on that gives us the best chance of obligating funds. These dates are reflected in the FOA. I think everyone agrees this is a challenging schedule and will require close coordination to accomplish. Once the FOA is released I will send out calendar invites to the dates that will require the attention of most of the office. Let me know if you have any questions.

1. FOA Released - April 16th
2. Concept papers due – May 9th
3. (b) (5)
4.
5.
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11.
12.

Best,
Victor

Rodriguez, Susan (CONTR)

From:	/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=4C5AEFFD8B6E4C19861AAA88B8CECB63-GARSON, JEN
Sent:	Wednesday, May 02, 2018 9:33 AM
To:	Unruh, Timothy
Subject:	FOAs list and OMB Briefing Decks
Attachments:	Combined FOA Spreadsheet for OMB Briefing.xlsx; GTO OMB Brief for David Hester.pptx; SETO OMB Brief for David Hester.pptx; WETO OMB Brief for David Hester.pptx; WPTO OMB Brief for David Hester.pptx

Tim -

Per you request, please find attached the combined FOA list for FY17, FY18, and FY19. And attached are each of the offices' presentations to the new examiner. While the OMB briefing you will do is to the broader sector in OMB, I thought these might be useful as you prepare.

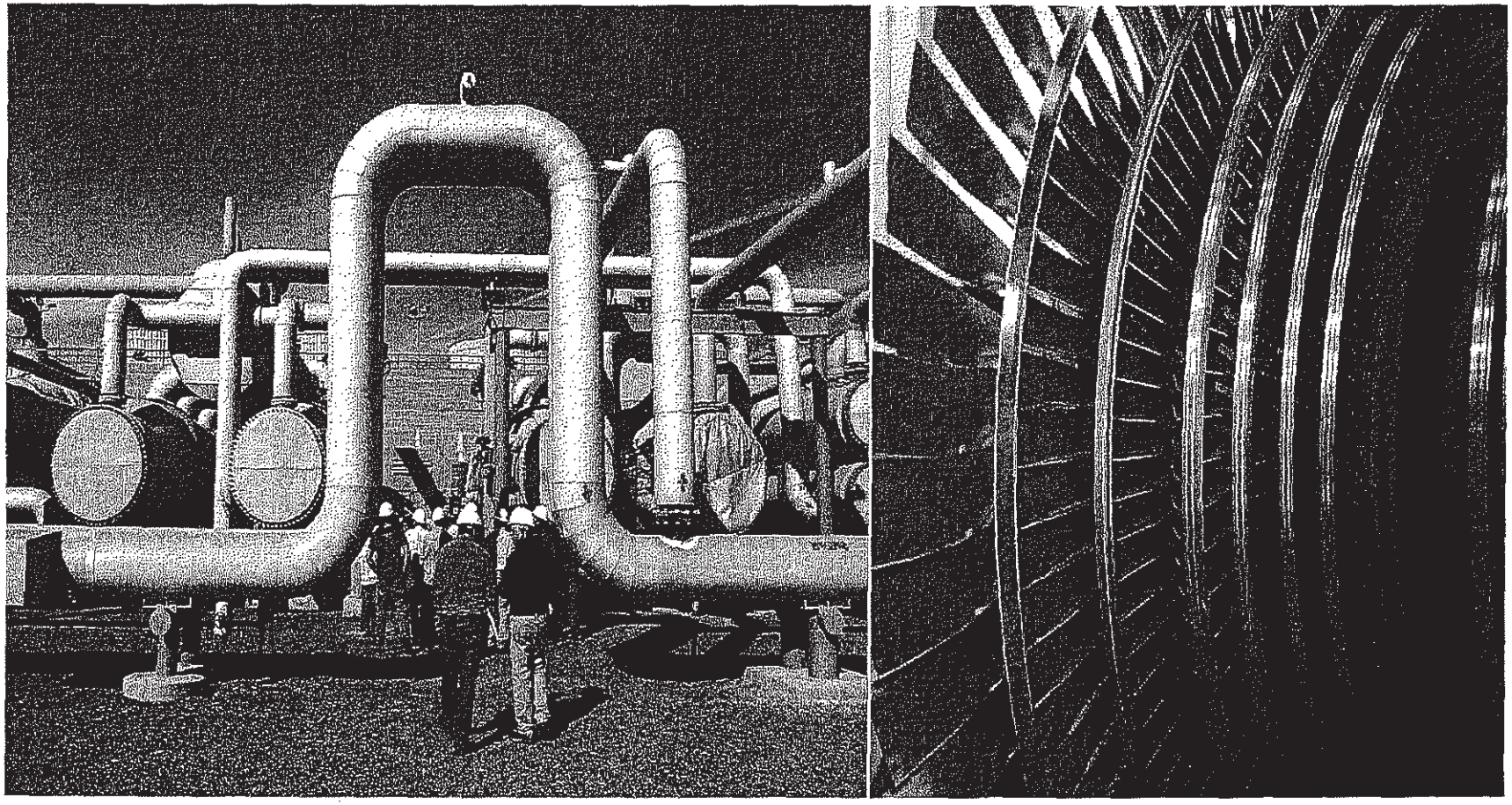
Best,
Jenn

Jennifer Garson
Chief of Staff
Office of Deputy Assistant Secretary for Renewable Power
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Jennifer.Garson@ee.doe.gov | (202) 586-0082 (w) | (b) (6) (m)

Office	FOA #	FOA Name / Brief Description	Value	# Selections	FY
GTO	DE-FOA-0001880	Efficient Drilling for Geothermal Energy (EDGE)	$14,500,000	8 to 10	FY18
GTO	TBD	Zonal Isolation FOA	$4,450,000	2 to 5	FY18
GTO	TBD	Machine Learning FOA (Advanced Optimization Algorithms for Geothermal)	$3,640,000	4 to 8	FY18
GTO	N/A	FORGE		1	FY18
SETO	DE-FOA-0001840	Solar Energy Technologies Office FY18 Funding Opportunity Announcement	$105,500,000	70	FY18
WETO	TBD	Advanced Components and Operations R&D	$6,000,000	6 to 8	FY18
WETO	TBD	Offshore Wind Resource Science	$8,000,000	1	FY18
WETO	TBD	Collaborative FOA with AMO on Thermoplastics Composites and 3-D Printing for Offshore Wind Applications	$3,000,000	1 to 2	FY18
WETO	TBD	NWTC Upgrades			FY18
WPTO	TBD	Hydropower – Pumped Storage Hydropower (NOTE: will be combined with HydroNEXT)	$10,000,000	Between 1 and 5	FY18
WPTO	DE-FOA-0001837	Marine and Hydrokinetic Technology Advancement and Data Dissemination	$22,300,000	Between 1 and 4	FY18
WPTO	DE-FOA-0001836	HydroNEXT: Standard Modular Hydropower	$2,000,000	4	FY18

Status of FOA Process
Released
Briefing Scheduled for PDAS
In MA Review
Down-Select for FORGE
Released
In MA Review
In MA Review
Briefing Not Scheduled
Briefing Not Scheduled
FOA being drafted
Released
FOA being drafted

Geothermal Technologies Office



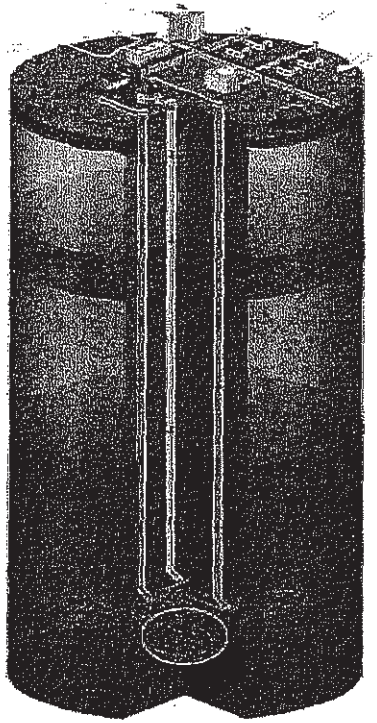
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Dr. Susan Hamm, Director

Why Does Geothermal Matter?

Geothermal...

- An always-on energy source that harnesses the earth's natural heat
- Improves domestic energy security and energy independence
- Provides baseload (24-hr) power with flexible on/off
- Creates thousands of valuable energy sector jobs and strengthens local economies
- On path to becoming a widely available renewable energy source...an "everywhere" solution



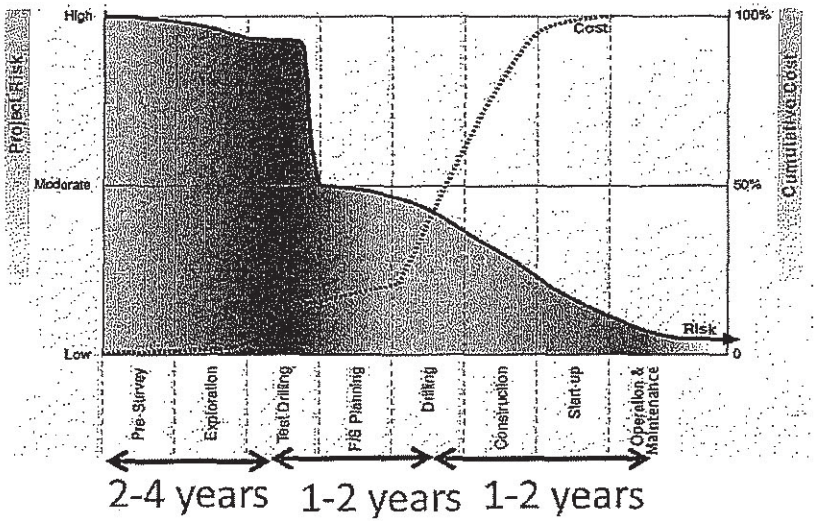
GTO is built on a legacy of innovation. Geothermal (DOE) research and investment led to development of the **PDC drill bit**, a game-changing technology that has delivered more than **$7.8 billion in cost savings** – primarily in the oil and gas industry – since 1982.

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Geothermal Technologies Office: Mission

- The mission of the Geothermal Technologies Program (GTO) is to support early-stage research and development (R&D) to strengthen the body of knowledge upon which industry can accelerate the development and deployment of innovative geothermal energy technologies.

- GTO focuses on areas such as drilling cost, success probability, and new technologies to reduce the risk in early stage



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GTO Key Goals, Objectives, and Priorities

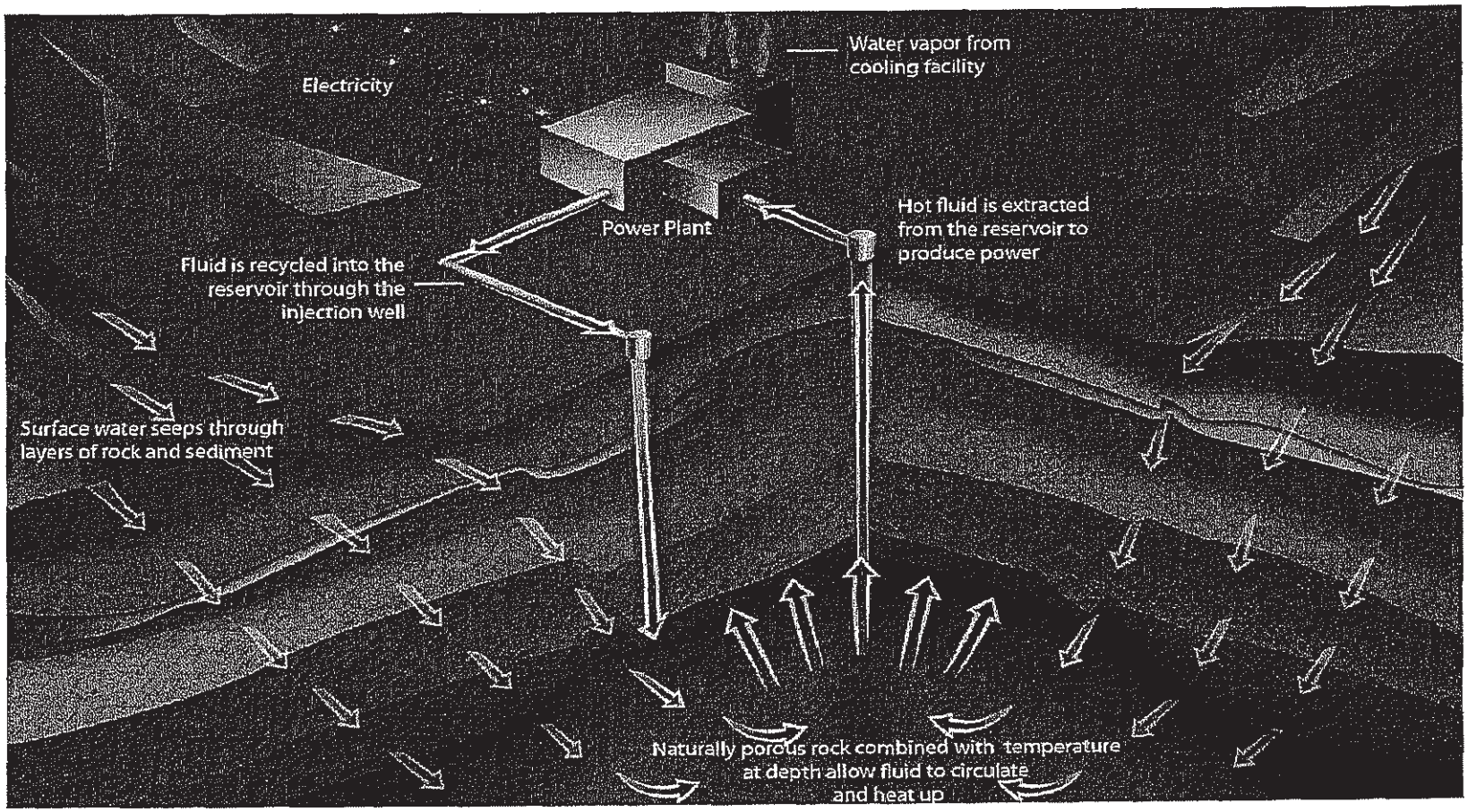
Transition from Near to Long Term

	Low Temp	Co-Production	Blind Hydrothermal	In- and Near-Field EGS	Greenfield EGS
Timeline	Near Term	Near Term	Near to Intermediate	Near to Intermediate	Long Term
Strategy	Utilize waste-heat / promote distributed energy	Leverage O&G infrastructure	Promote Sector Growth	Maintain / expand existing fields	Develop replicable model for commercial scale-up
Scale	100's KW to several MW scale	10's-100's MW, aggregate to GWs potential	10's GW additional potential	5 - 10GWs potential-low risk	10's - 100's GW potential - higher risk
Constituency	Local Direct Use	Growing Interest, New Potential Sector	Majority of the Private Sector	Private Sector, very few companies to date	High potential for growth and new entrants resulting from EGS Field Observatory

GTO Operational Space

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Typical Geothermal Power Plant



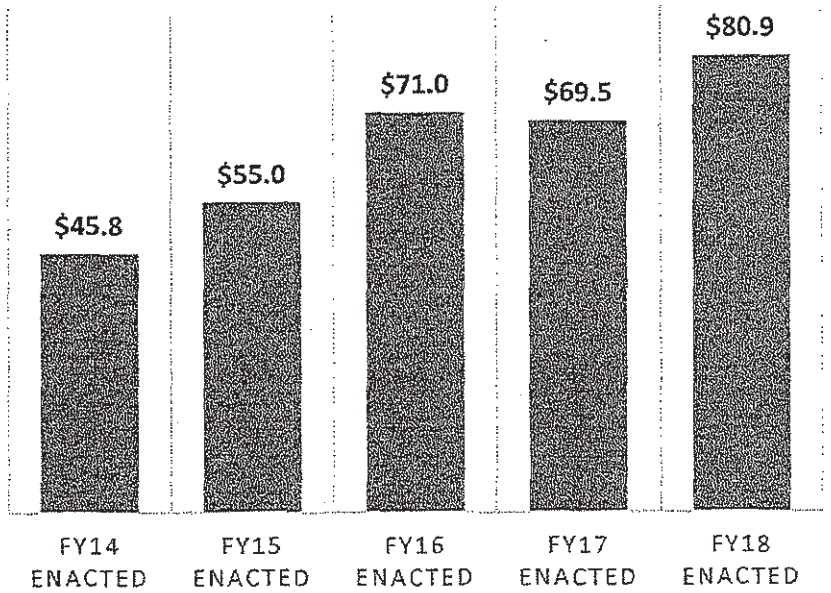
Hot fluid (water, steam, or both) produced from wells drilled into ground → **Fluid passed through power plant to generate electricity** → **Fluid (usually) re-injected back into ground**

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

GTO Budget Overview (2014-2019)

($ in Millions)

GTO APPROPRIATIONS
(PAST 5 YEARS)



(b) (5)

GTO FY19 Budget Request ($30.0M)
(By Subprogram)

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

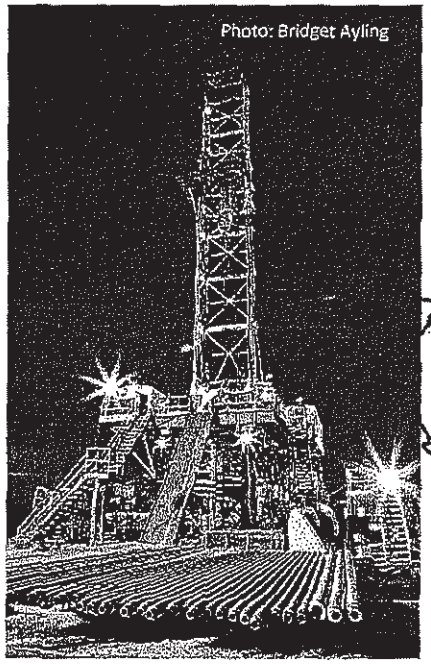
FY 2019 Congressional Request

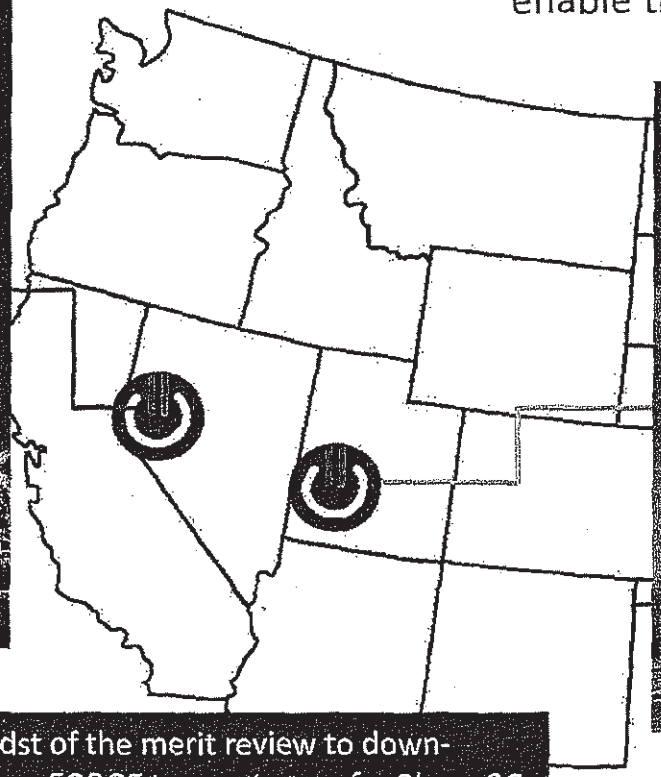
Major Activities

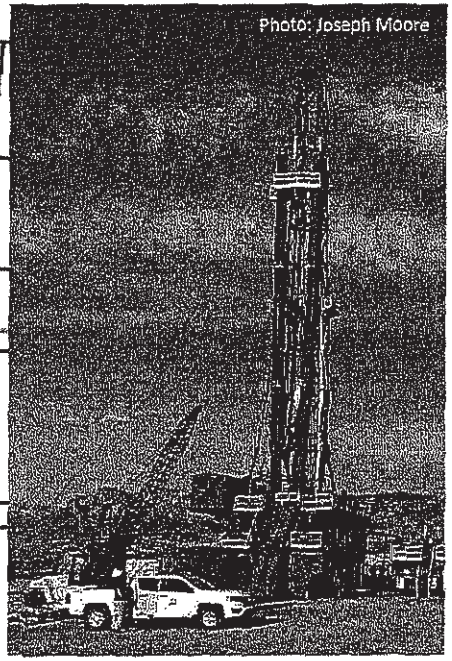
- Frontier Observatory for Research in Geothermal Energy (FORGE)
- EGS Collab
- Subsurface Stress Measurement and Simulation
- Beyond Batteries

The FORGE Initiative

The FORGE objective is to design and test a reproducible approach to **developing large-scale, economically sustainable EGS reservoirs** and enable their widespread deployment.







We are in the midst of the merit review to down-select from the two FORGE teams to one for Phase 2C and Phase 3. We anticipate announcing the final selected site within a few months.

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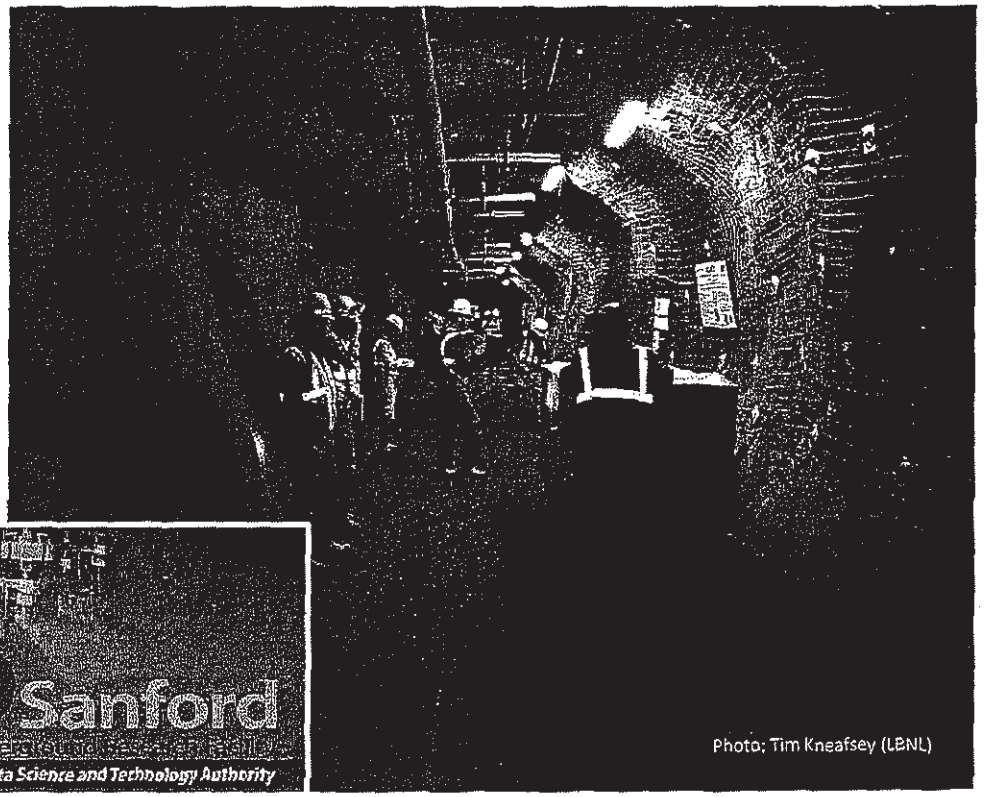
EGS Collab

COLLAB
A PATH TO FORGE
U.S. DEPARTMENT OF ENERGY

Drilling operations recently concluded at **SURF** (South Dakota), with stimulation and flow testing in Spring 2018.



Integrated modeling and field teams at SURF are validating the capabilities of predictive models in advance of FORGE.

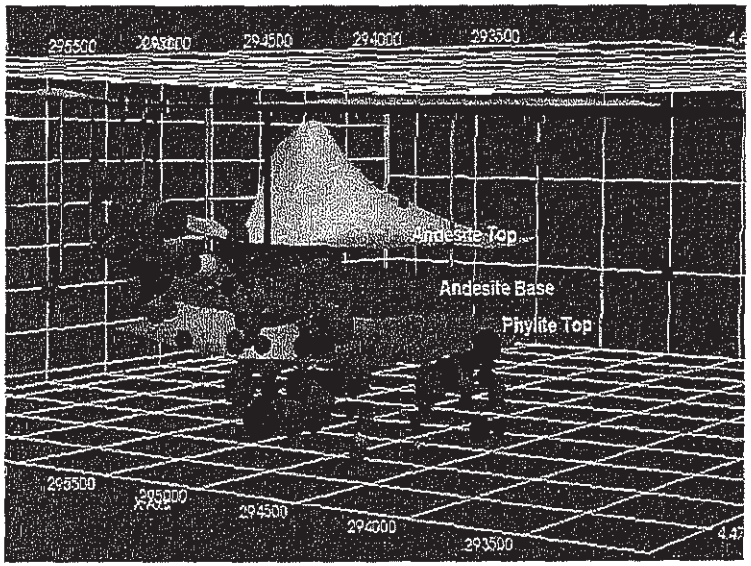


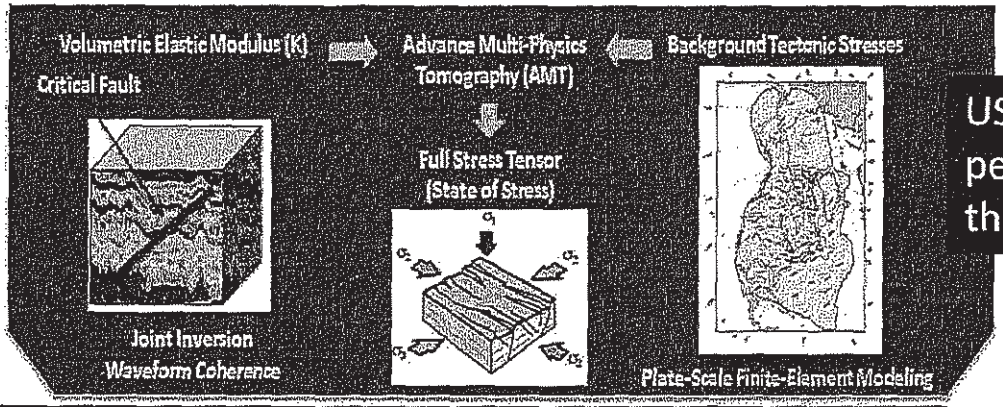
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State of Stress FOA – Subsurface R&D (formerly known as SubTER)

FY 2019 State of Stress FOA Focus Areas

- Improve resolution of meso-scale (0.1-10km) subsurface stress detection
- Increase understanding of subsurface stress simulation and inversion methodologies in order to improve reservoir management, fluid production, and wellbore integrity





US Geothermal developed 3D permeability models to characterize the reservoir state of stress

LANL developed state of stress models by relating regional & basin scale stress to a reservoir scale state of stress.

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FY 2018 Activities

Major Activities - Continuing

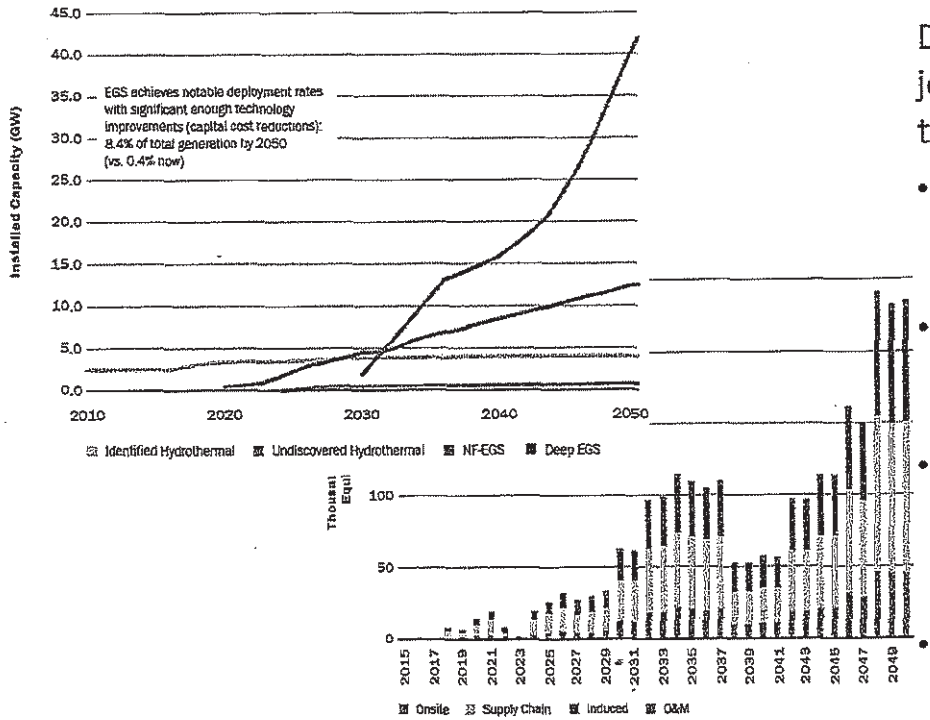
- GeoVision
- Frontier Observatory for Research in Geothermal Energy (FORGE)
- EGS Collab*
- Hydrothermal R&D (lab research)*

Major Activities - New

- FOA: Efficient Drilling for Geothermal Energy (EDGE)
- FOA: Machine Learning for Geothermal Energy and the Geosciences
- FOA: Zonal Isolation
- Lab Call: Waterless Stimulation*
- Lab Call: Hybridization & Beyond Batteries
- Prize: Advanced Manufacturing Competition

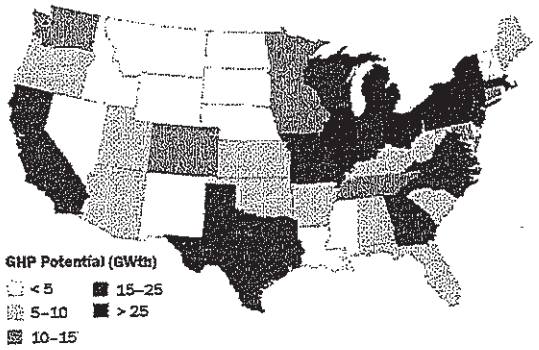
* Included in the FY 2018 CJ

Our Solution: GeoVision Study



DOE has developed a credible analysis jointly with the geothermal community that:

- Articulates **clear strategies** across different sectors and has a cohesive plan to attain the goals
- Discusses **geothermal growth scenarios** through 2050 backed by robust data, modeling and analysis
- Addresses **all market segments** -existing and potential hydrothermal, electrical and non-electrical usages, new EGS sector, and other value streams
- Is supported by **objective and peer-reviewed** industry data available to decision-makers



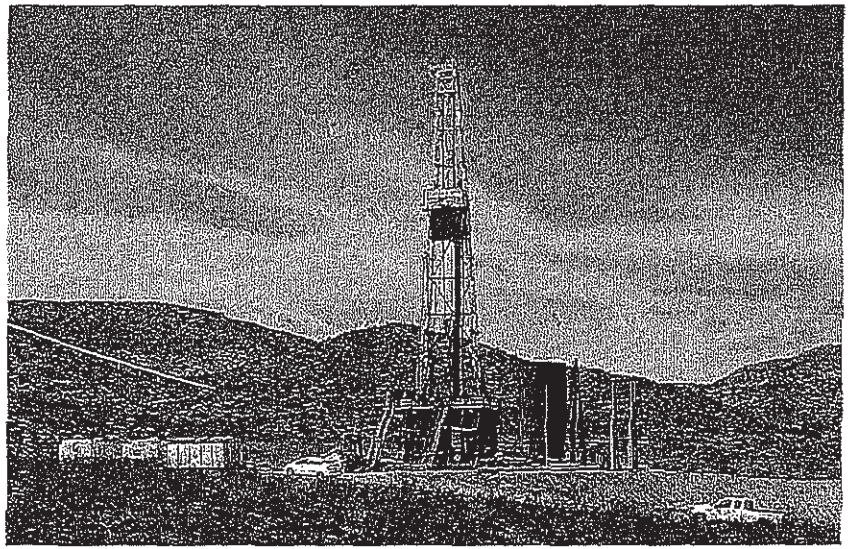
We are incorporating nearly 2000 comments from interagency and external reviewers. We anticipate getting the new draft back to OMB in late May, with an expectation of publishing over the summer.

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

Drilling FOA

Efficient Drilling for Geothermal Energy (EDGE)

- Open: April 23, 2018
- Up to **$14.5 million** in new funding
- Application process:
  - ✓ Concept paper (mandatory)
  - ✓ Full application
- Concept papers due May 31, 2018

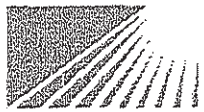


Topic Area 1	Early-stage R&D projects to reduce common delays in drilling operations.
Topic Area 2	Early-stage R&D projects in innovative drilling technologies that improve rate of penetration.
Topic Area 3	Innovative approaches and models to improve knowledge transfer in the geothermal industry.

Greetings from the GTO Team!



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



SOLAR ENERGY
TECHNOLOGIES OFFICE
U.S. Department Of Energy

Presentation for David Hester

Solar Energy Technologies Office

Charlie Gay
Director
24 April 2018

energy.gov/solar-office

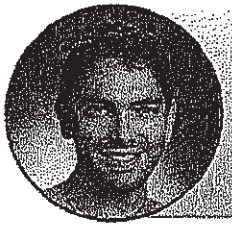
Solar Energy Technologies Office Staff



Solar Energy Technologies Office (SETO) SubPrograms and Project Managers



Concentrating Solar Power
Dr. Avi Shultz,
Program Manager (Acting)



Photovoltaics
Dr. Lenny Tinker,
Program Manager



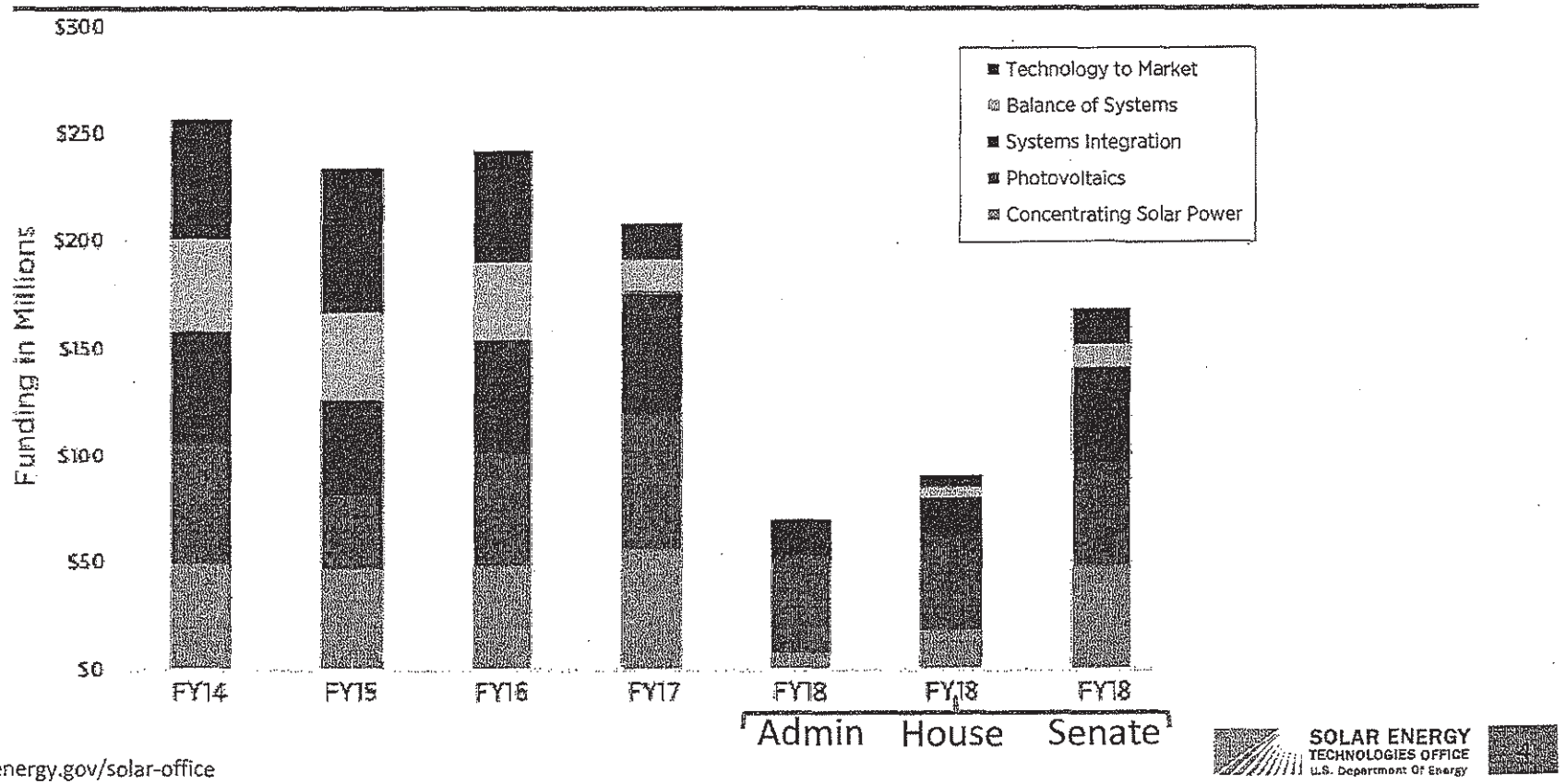
Systems Integration
Dr. Guohui Yuan,
Program Manager



Technology to Market
Garrett Nilsen, Program Manager

Balance of Systems (Soft Costs)
Garrett Nilsen, Program Manager (Acting)

SETO Historical Funding and Range for FY 2018



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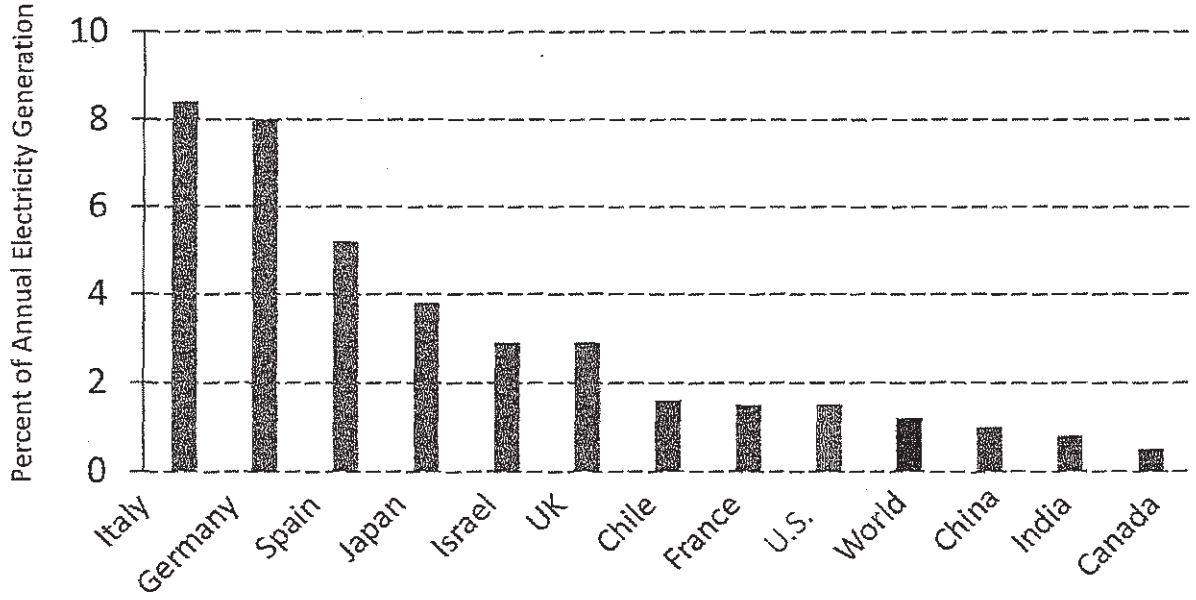
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Budget Details

SETO Funding Table by Subprogram					
($ Thousands)	FY 2016 Enacted	FY 2017 Enacted	FY 2018 Specified	FY 2018 Approved	FY 2019 Request
Solar Energy Technologies	**241,600**	**207,600**	**200,500**	**241,600**	(b) (5)
Concentrating Solar Power	48,400	55,000	55,000	55,000	
Photovoltaic Research and Development	53,152	64,000	70,000	70,000	
Systems Integration	52,447	57,000	45,000	71,200	
Balance of Systems Soft Cost Reduction	34,913	15,000	10,500	11,000	
Innovations in Manufacturing Competitiveness	43,488	16,600	20,000	34,400	
NREL Site-Wide Facility Support	9,200				

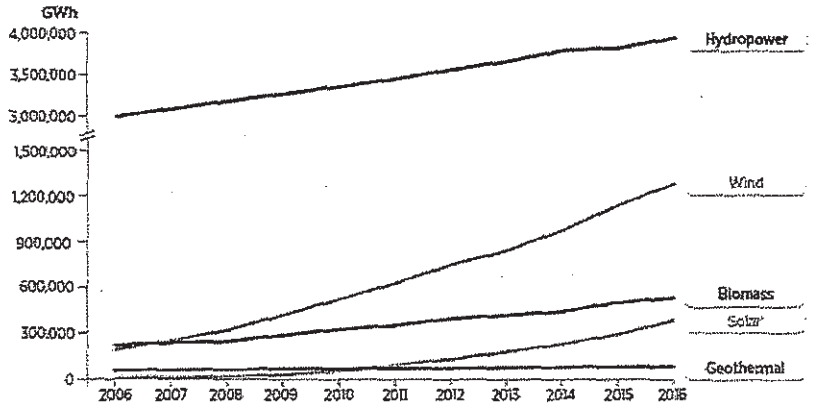
Solar Supplies Nearly 2% of U.S. Electricity

More progress must be made in order to take advantage of this domestic energy resource and to compete in the growing global market.



Sources: International Energy Agency, "2015 Snapshot of Global Photovoltaic Markets"; "Solar Thermal Electricity Global Outlook 2016"; National Renewable Energy Laboratory, "U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017".
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Global Renewable Energy Generation



Despite rapid growth over the past 10 years, solar still represents a relatively small portion of global electric power

In 2016 solar represented 1.6 % of global electricity generation PV and CSP represented 4.6 % and 0.1 % of installed global electricity capacity, respectively.

Sources: U.S. Department of Energy, "2016 Renewable Energy Data Book."
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Quick Photovoltaic (PV) Facts - Global

Parameter	Value	Status	Reference
PV market	98 GW	2017	BNA / IHS / IHS
Cumulative installation	401 GW	End of 2017	Ren21/FS-UNEP/BNEF
PV power consumption	333 TWh	2016	BP
PV electricity share	1.6%	2016	NREL
c-Si share of production	93%	2016	IHS
Record solar cell efficiency: III-V MJ (conc.) / mono-Si / multi-Si / CIGS / CdTe	46.0 / 26.7 / 22.3 / 21.7 / 21.0%	Feb. 2018	Green et al.

National Lab Funding in 3 Year Cycles

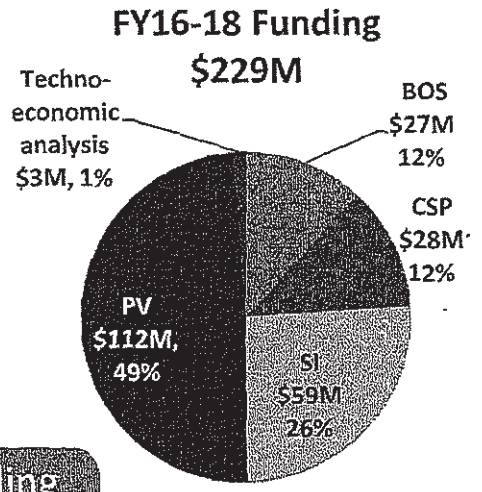
SETO competitively selects multi-year lab projects on a 3 year cycle, to provide continuity of effort in areas of critical importance to DOE's mission. The call for proposals for the next multi-year funding program is targeted for a November release, to select projects for FY19-21.

Labs are also involved in FOA projects

Lab Proposal Development Process
FY13-FY15 ($227M*)

SunShot National Laboratory Multiyear Partnership (SuNLaMP)
FY16-FY18 ($229M*)

SETO Multi-year Lab Funding
FY19-FY21 ($120M**)
~$45M lab call + ~$75M in funding for core capabilities



* Includes ~$27M of NREL sitewide funding
** Uses FY19 request level for 3 years

Global Photovoltaics (PV) Market

The global PV market had an approximate volume of 98 GW in 2017, which lead to a cumulative PV installation of 401 GW worldwide.

Photovoltaics is a fast growing market: The Compound Annual Growth Rate (CAGR) of PV installations was 44% between 2010 to 2017.

Concerning PV module production in 2016, China &Taiwan hold the lead with a share of 68%, followed by Rest of Asia-Pacific & Central Asia (ROAP/CA) with 14%. Europe contributed with a share of 4% (was 5% in 2015); USA/CAN contributed 6%.

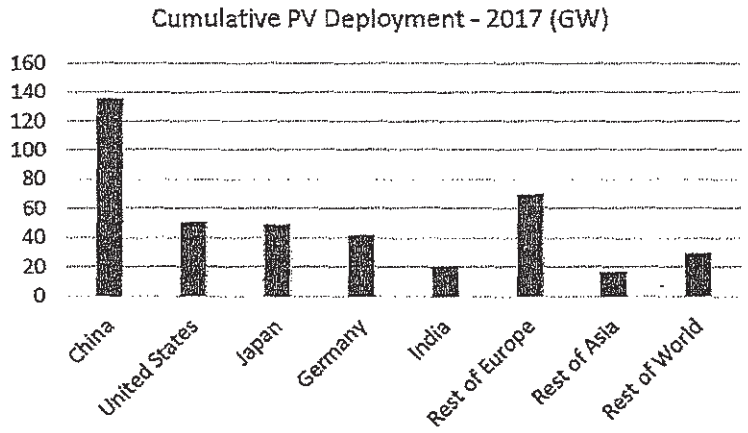
The leading 5 markets, in cumulative and annual PV installations at the end of 2017 were China, the U.S., Japan, India, and Europe.

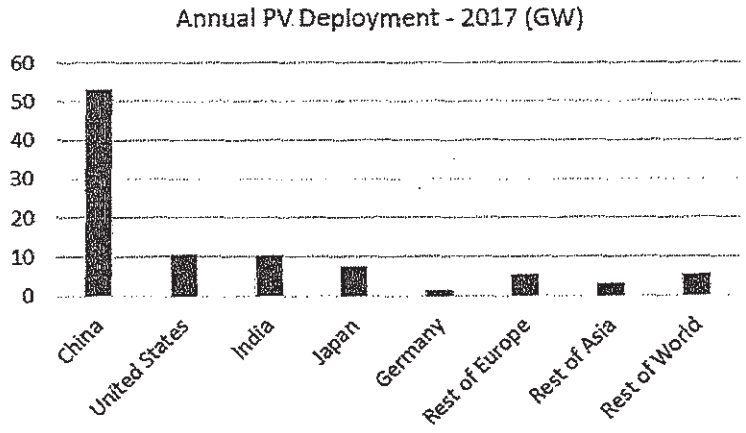
Si-wafer based PV technology accounted for about 94% of the total production in 2016, with thin-film technologies making up the remainder. The share of multi-crystalline technology is now about 70% of total production.

Global PV Installations

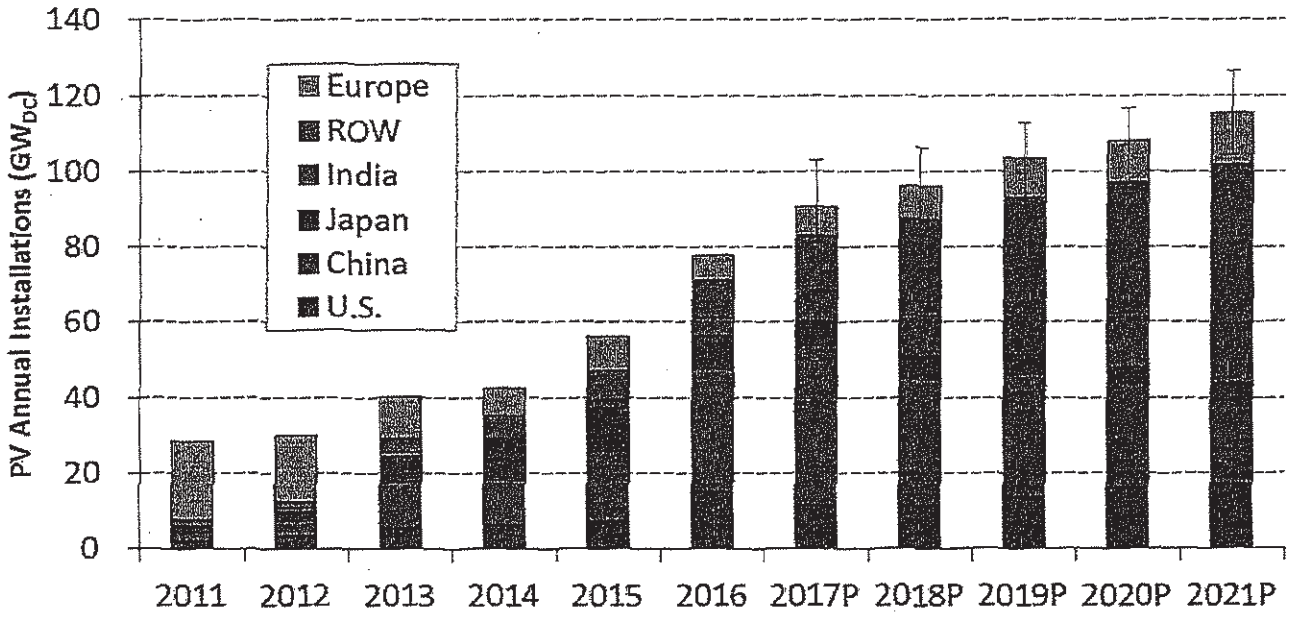
In 2017, approximately 98 GW of PV was installed globally, with more than half coming from China. China, by far the largest PV market, had installed over 135 GW by the end of 2017.

The leading 5 markets, in cumulative and annual PV installations at the end of 2017, were China, the U.S., Japan, India, and Europe.





Annual Global PV Demand 2011 -2021



Note: P = projection. Bar represents median projection. Error bars represent high and low projections.

Sources: Data displayed represent the median figures from the following sources: BNEF (08/18/17); Cowen & Co. (09/14/17); Deutsche Bank (10/03/17); GTM Research (July 2017); IHS Market, Technology Group, PV Demand Market Tracker, September, 2017.

Solar Cell / Module Efficiencies

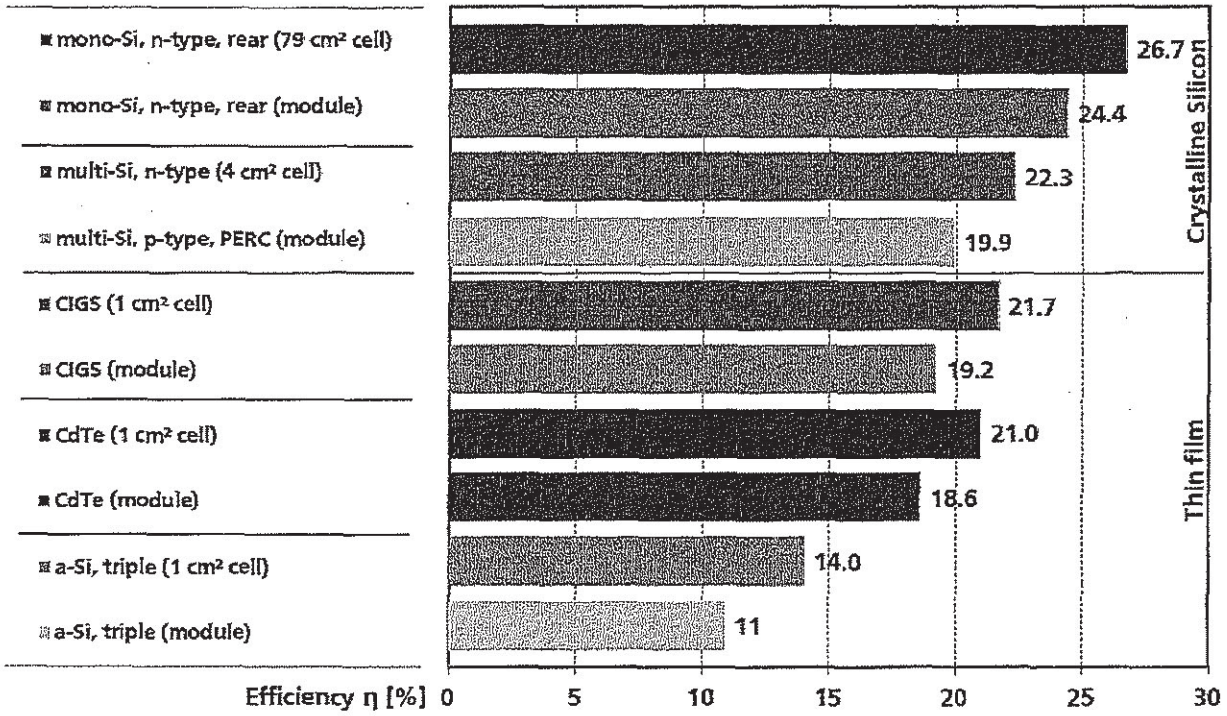
The record lab cell efficiency is 26.7% for mono-crystalline and 22.3% for multi-crystalline silicon wafer-based technology. The highest calibrated lab efficiency in thin film technology is 21.7% for CIGS and 21.0% for CdTe solar cells.

In the last 10 years, the efficiency of average commercial wafer-based silicon modules increased from about 12% to 17% (Super-mono 21%). At the same time, CdTe module efficiency increased from 9% to 16%.

In the laboratory, best performing modules are based on mono-crystalline silicon with 24.4% efficiency. Record efficiencies demonstrate the potential for further efficiency increases at the production level.

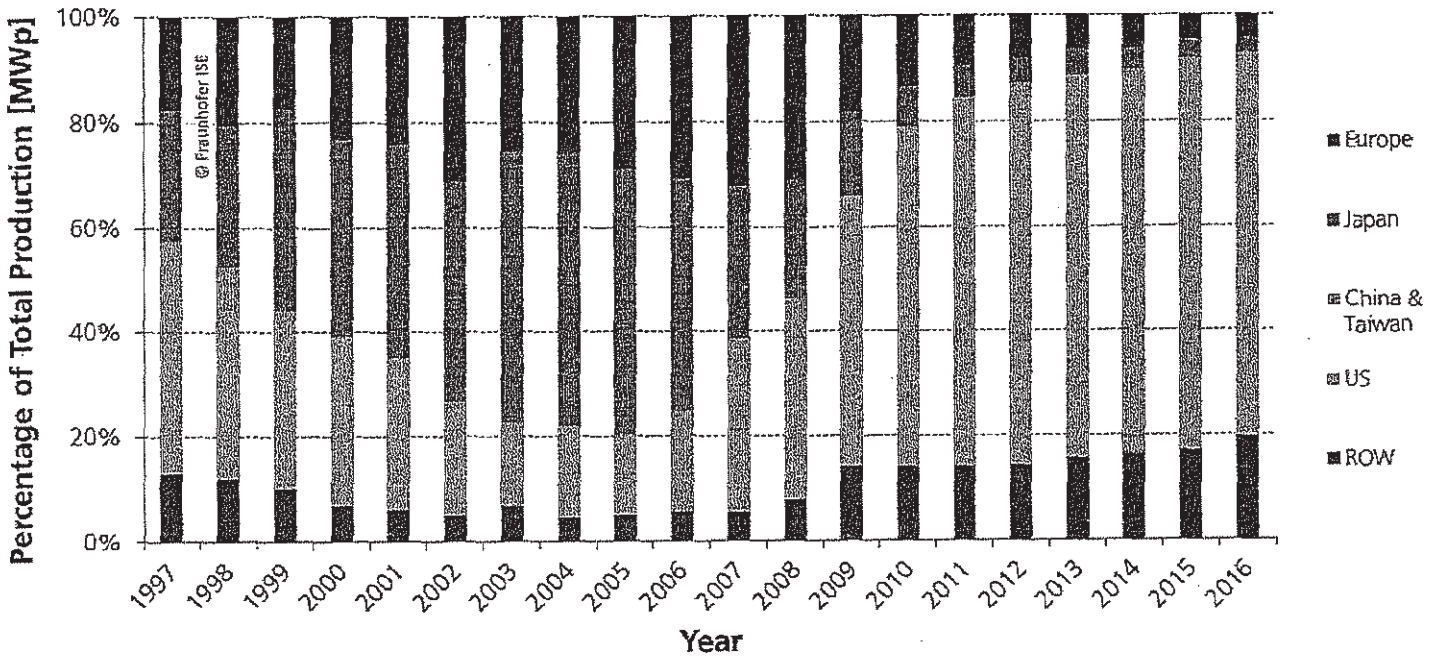
In the laboratory, high concentration multi-junction solar cells achieve an efficiency of up to 46.0% today. With concentrator technology, module efficiencies of up to 38.9% have been reached.

Best Lab Cells vs. Best Lab Modules



Data: Green et al.: Solar Cell Efficiency Tables (Version 51), Progress in PV: Research and Applications 2018. Graph: PSE 2018

PV Module Production by Region 1997-2016
Percentage of Total MWp Produced



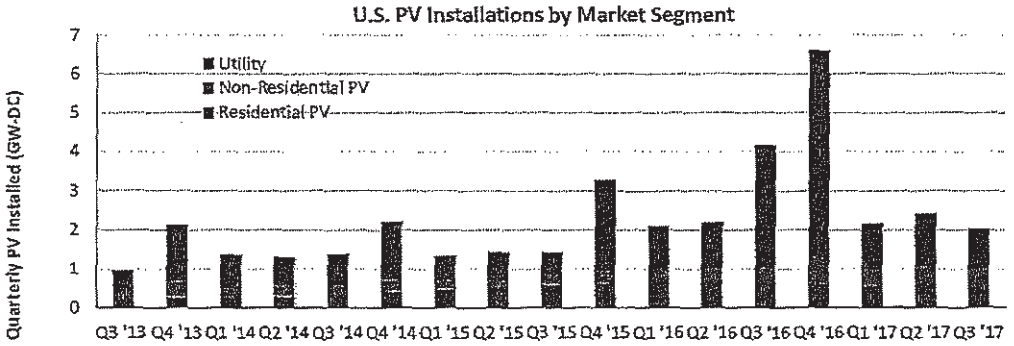
Data: Up to 2009: Navigant Consulting; since 2010: IHS. Graph: PSE AG 2017

Global Leading PV Manufacturers, by Shipments

	2016		2015		2010		2005	
Rank	Manufacturer (2016)	Shipments (GW)	Manufacturer (2015)	Shipments (GW)	Manufacturer (2010)	Shipments (GW)	Manufacturer (2005)	Shipments (GW)
1	Trina	5.0	Trina	3.6	Suntech	1.6	Sharp	0.375
2	JA Solar	4.9	JA Solar	3.6	JA Solar	1.5	Kyocera	0.142
3	Hanwha	4.0	Hanwha	3.4	First Solar	1.4	Q-Cells	0.131
4	Jinko Solar	3.9	Canadian Solar	2.7	Yingli	1.1	Schott Solar	0.095
5	Motech	2.9	First Solar	2.5	Q-Cells	1.0	BP Solar	0.086
6	First Solar	2.7	JinkoSolar	2.4	Sharp	0.9	Mitsubishi	0.085
7	Longi Leri	2.7	Yingli	2.4	Trina	0.9	Sanyo	0.084
8	Canadian Solar	2.4	Motech	2.1	Motech	0.9	Shell Solar	0.055
9	Yingli	2.4	Neosolar	2.1	Gintech	0.8	Motech	0.045
10	Shunfeng-Suntech	2.2	Shunfeng-Suntech	2.0	Kyocera	0.6	Isofoton	0.039
Other		36.4		26.8		6.8		0.270
Total		69.5		50.9		17.4		1.410

Quick Facts –U.S.

Parameter	Value	Status	Reference
PV market	10.6 GW	2017	GTM Research / SEIA
Cumulative installation	51.6 GW	End of 2017	GTM Research / SEIA
PV power production	73.8 TWh	2017	EIA
PV electricity share	1.8%	2017	EIA
c-Si share of production	70%	2017	GTM Research / SEIA

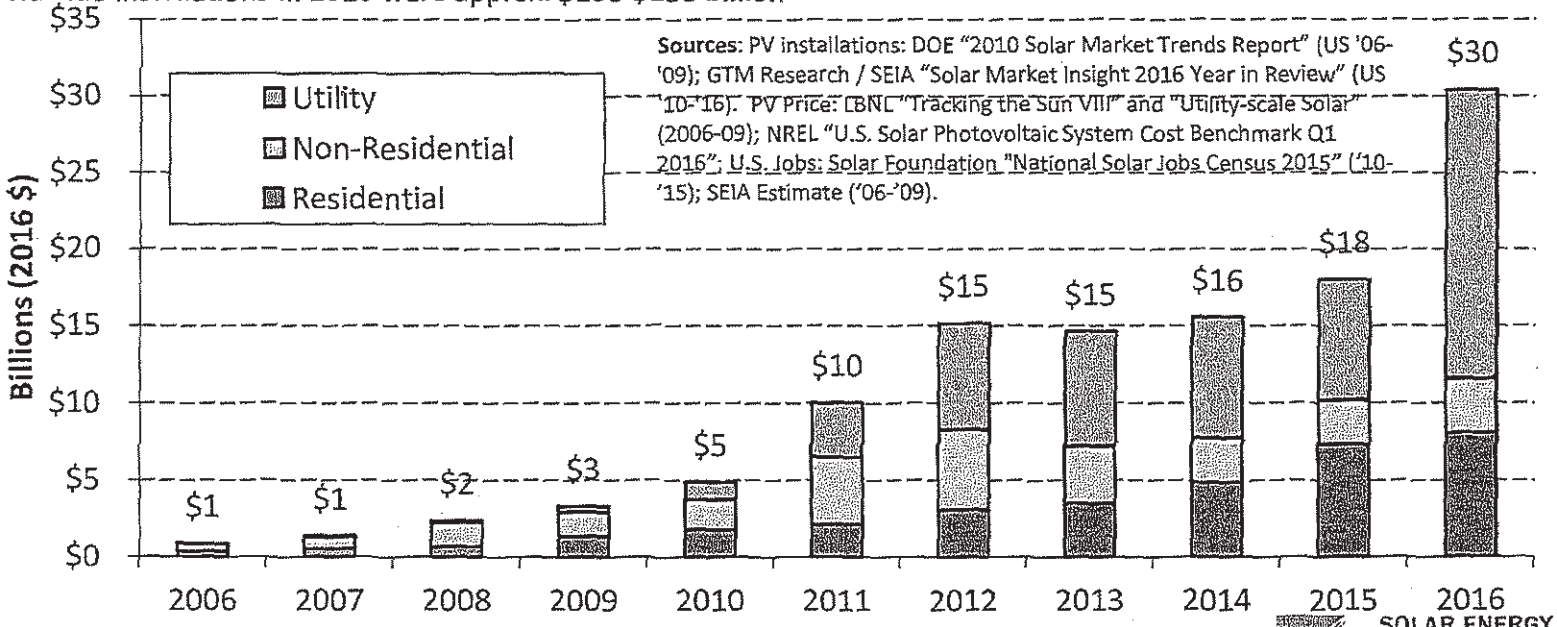


US PV Market

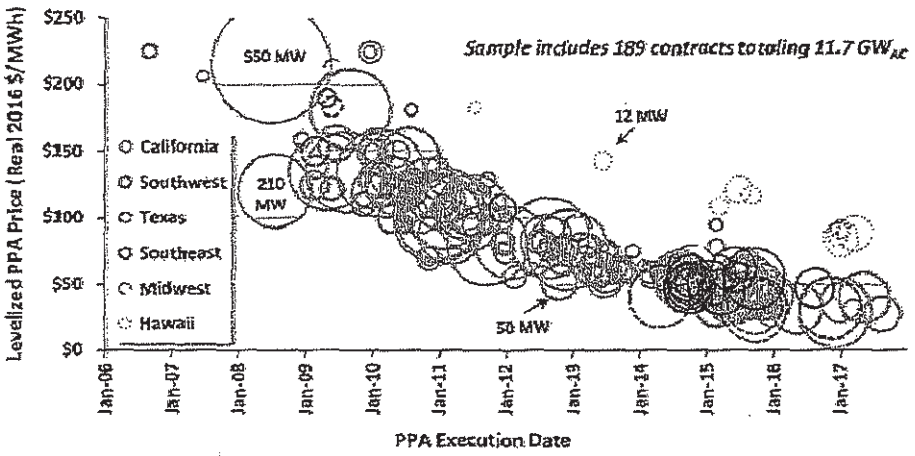
- Annual U.S. PV installations grew 100x from 2006 to 2017, with over 50 GW-DC of cumulative installations
  - In 2017 PV represented 29 % of all new U.S. generating capacity
- The U.S. energy market consists of many different state, regional, and local markets
  - PV is much more competitive in certain areas and penetration levels vary dramatically California, which has represented approximately ½ of the U.S. market, received approximately 16% of its electric generation from solar in 2017.

Estimated Value of U.S. Solar Installations

- The estimated value of U.S. PV Installations in 2016 was approximately $30 billion
  - This represents an increase of 69% over 2015
  - 62% of 2016 annual value was in the utility sector, 26% in the residential sector, and 12% in the non-residential sector
- Worldwide installations in 2016 were approx. $100-$150 billion



U.S. PV PPA pricing has rapidly dropped in recent years



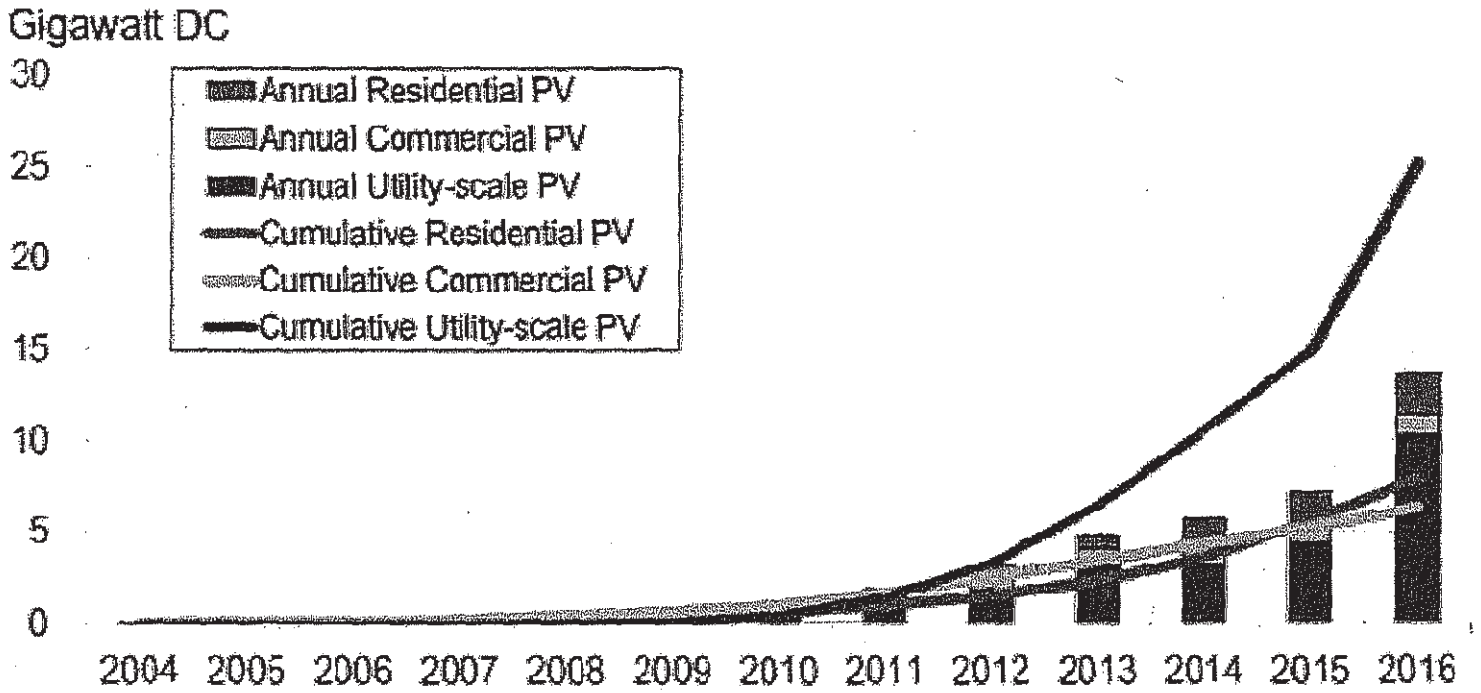
There has been a strong, steady downward PPA price trend since 2006, with an average levelized price signed in 2016 of ~$35/MWh.

> The median unsubsidized LCOE of utility-scale PV projects built in 2016 was below the DOE SunShot target of 6 cents/kWh.

California and the Southwest dominate the sample, but 2014–2016 saw a broadening of the market to Texas, Arkansas, Alabama, Florida—and even Minnesota and Michigan.

Source: Bolinger, M. , J. Seel, K. H. LaCommare. 2017. *Utility-Scale Solar 2016: An Empirical Analysis of Project Cost, Performance, and Pricing Trends in the United States*. Berkeley, CA: Lawrence Berkeley National Laboratory.

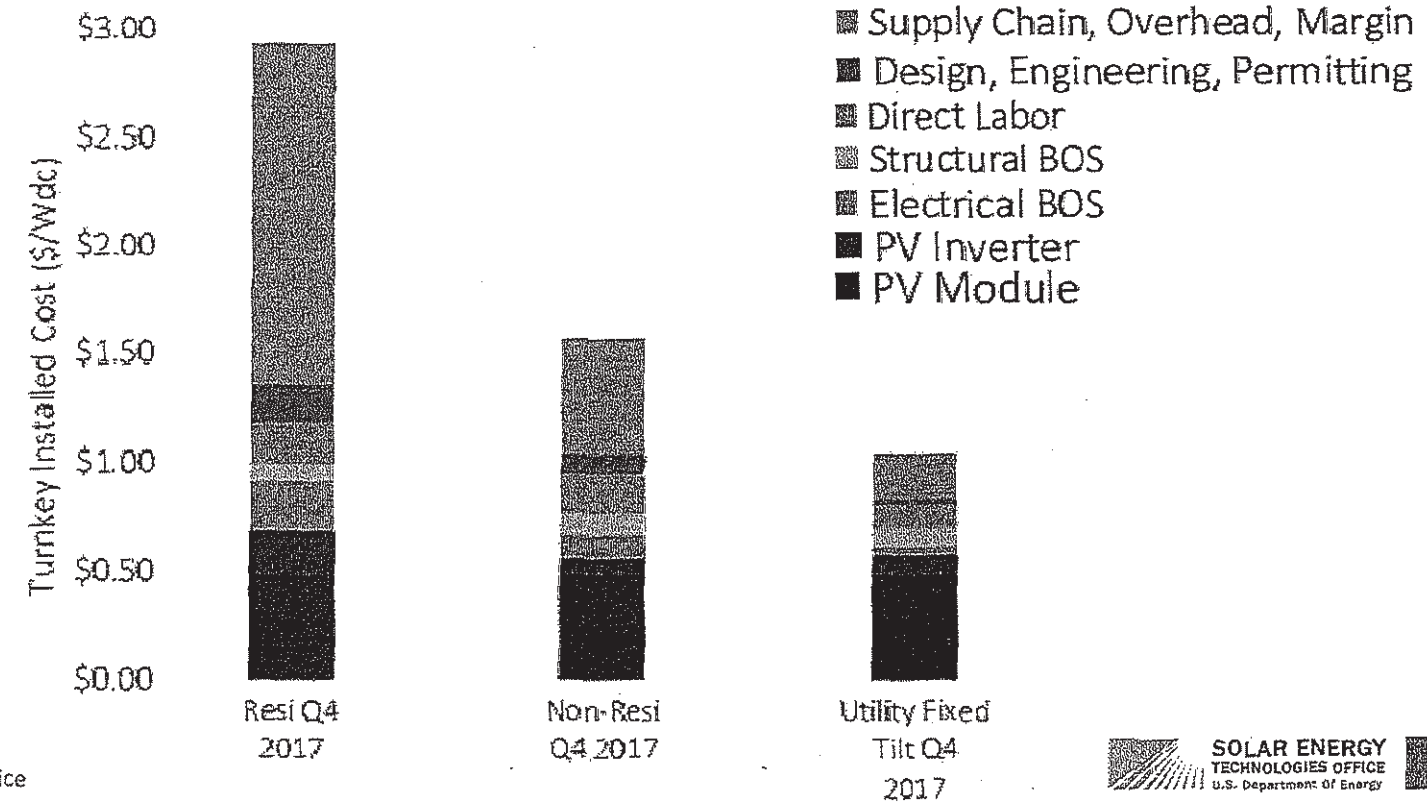
US Solar PV Market Growth



U.S. PV market growth, 2004–2016, in gigawatts of direct-current (DC) capacity (Bloomberg 2017)

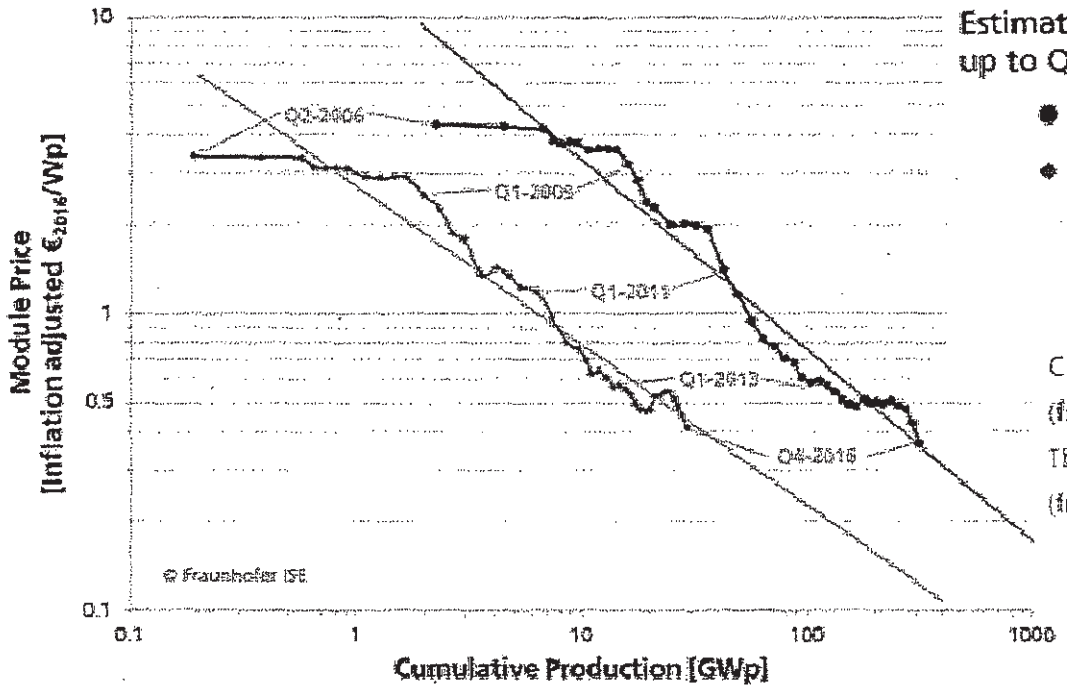
Source: NREL/PR-6A20-68580

Modeled U.S. National Average System Costs by Market Segment, Q4 2017



Source: GTM
energy.gov/solar-office

PV Learning Curves



Estimated cumulative production up to Q4, 2016 :

- c-Si 312 GWp
- Thin Film 29 GWp

Crystalline Technology
(from Q2-2006 to Q4-2016) **LR 29**

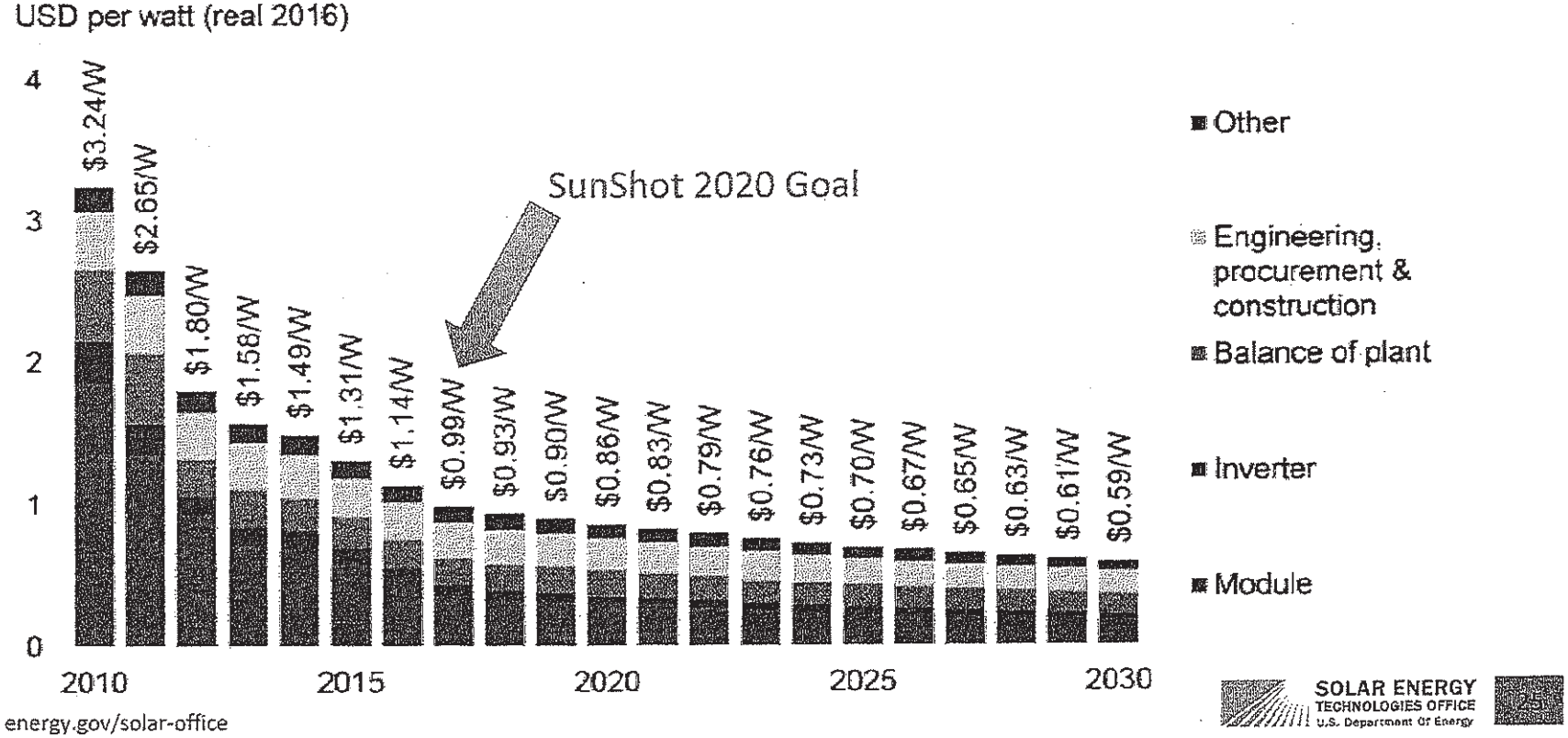
Thin Film Technology
(from Q2-2006 to Q4-2016) **LR 25**

Data: from 2006 to 2010 estimation from different sources ; Navigant Consulting, EUPD, pvXchange; from 2011 to 2016: IHS. Graph: PSE AG 2017

SETO 2017 Highlights

- Announced the solar industry met SunShot's utility-scale solar goal 3 years ahead of schedule, and, as a result of the dramatic progress in cost reduction, SETO is expanding its emphasis on how solar integrates with and supports the grid
- Announced nearly $100M in new funding opportunities and the investment of $80M in more than 60 projects.

Global price benchmark for fixed-axis PV power plants



energy.gov/solar-office

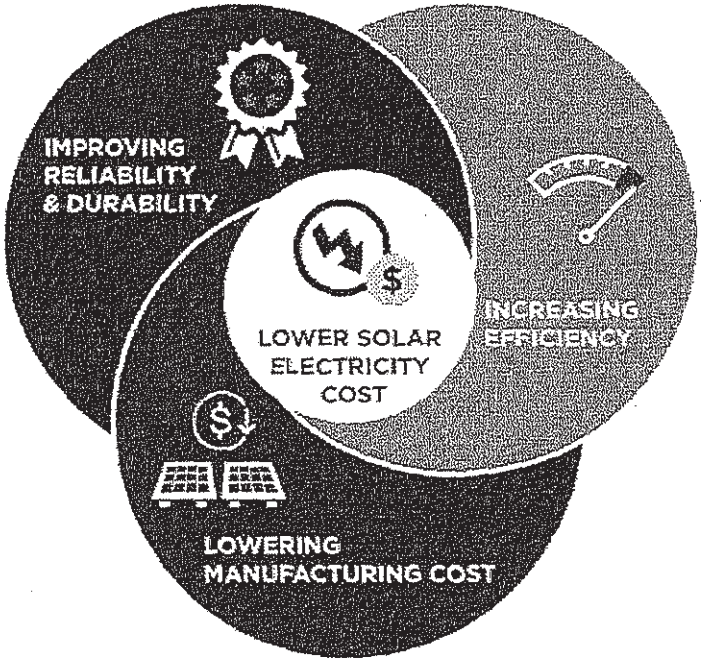
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Photovoltaics Subprogram

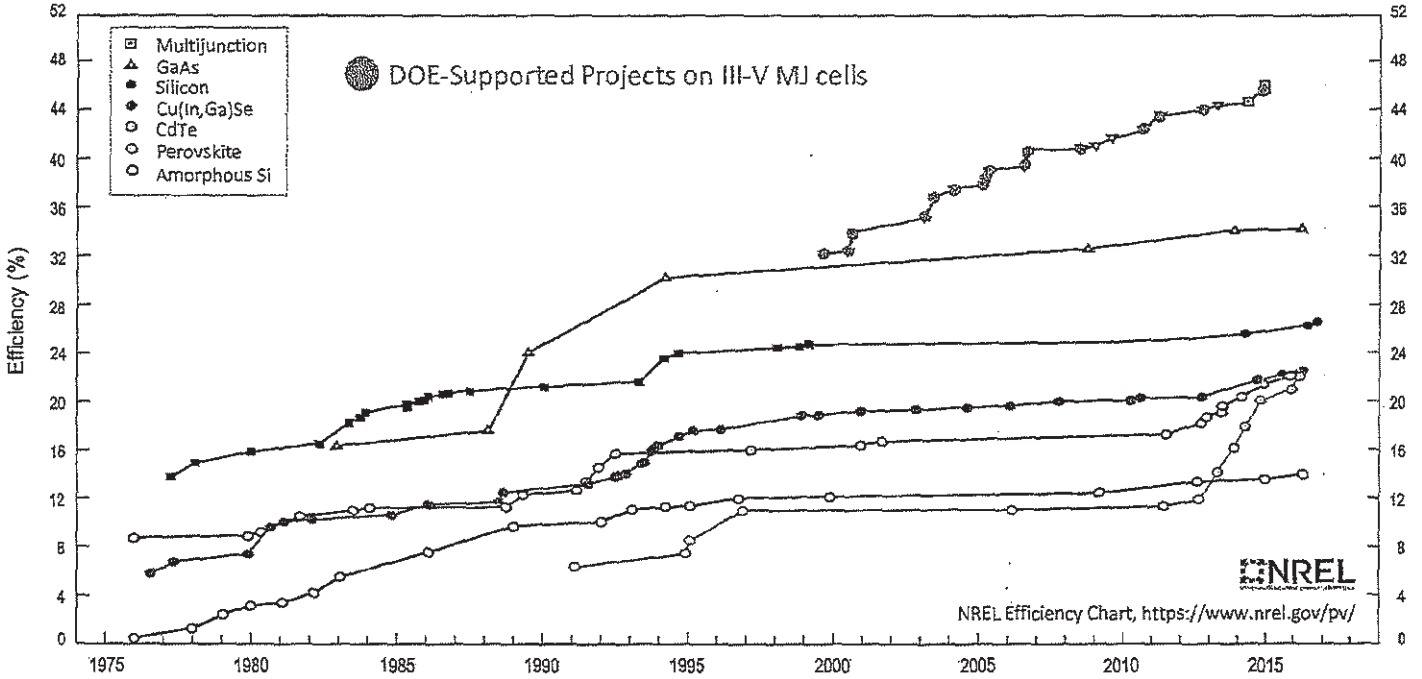
Funds research with a 10-15 year horizon, which is beyond industry focus or capabilities

Supports an innovation ecosystem that includes universities, students, professors, and the private sector

Current Focus: Improving reliability and efficiency of new and existing PV technology

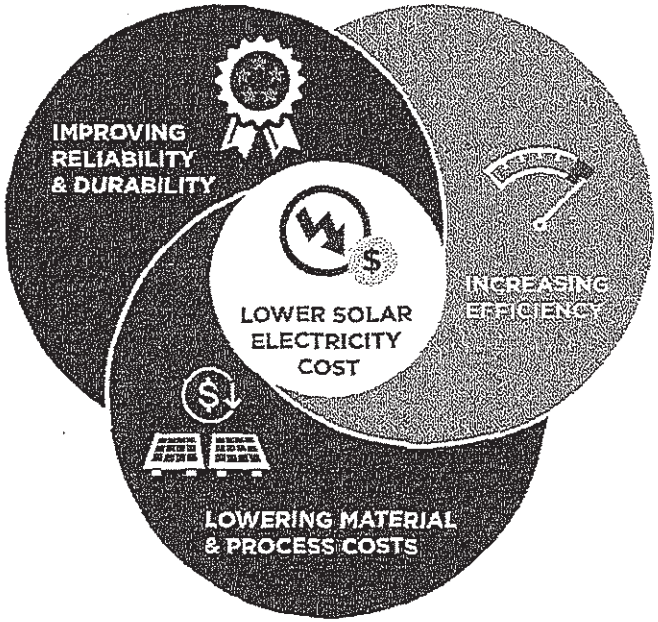


DOE R&D Drives Solar Cell Efficiency Records



- More than 40% all solar cell efficiency world records have been directly funded by DOE

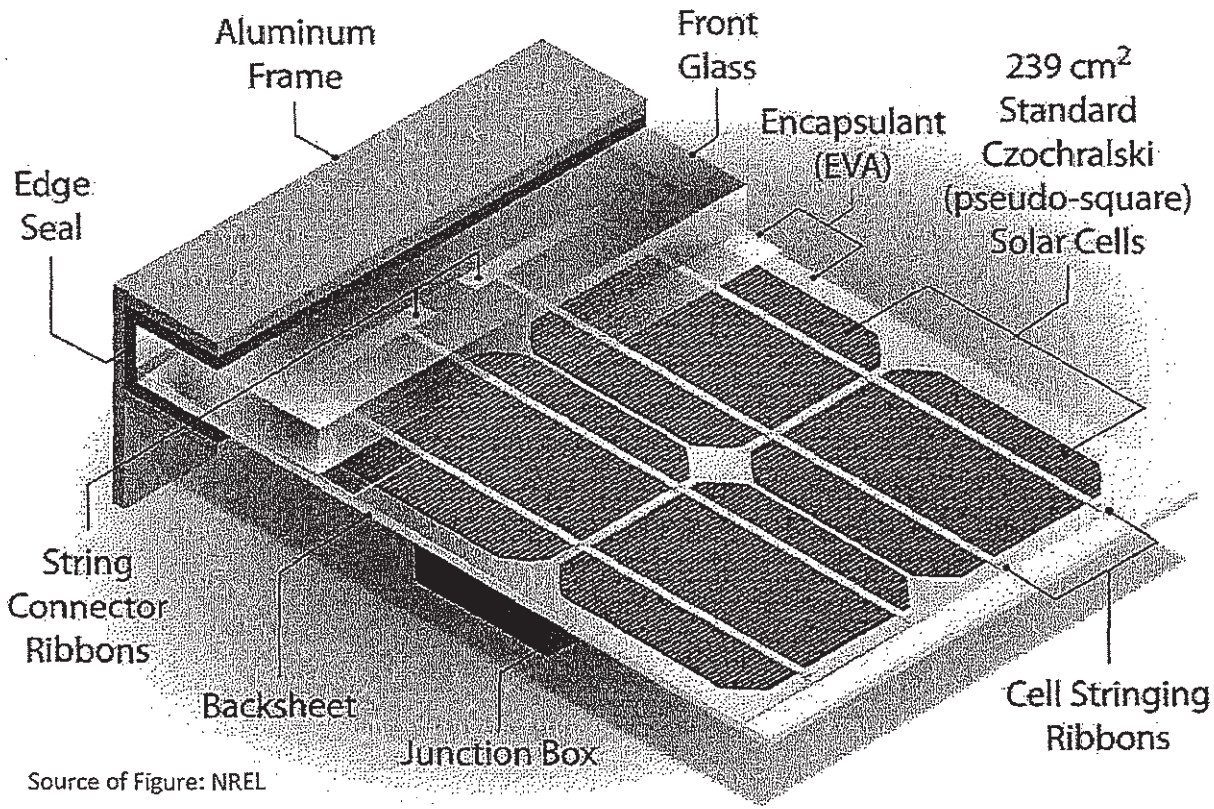
Photovoltaics R&D Subprogram



SETO PV FUNDING PROGRAMS:

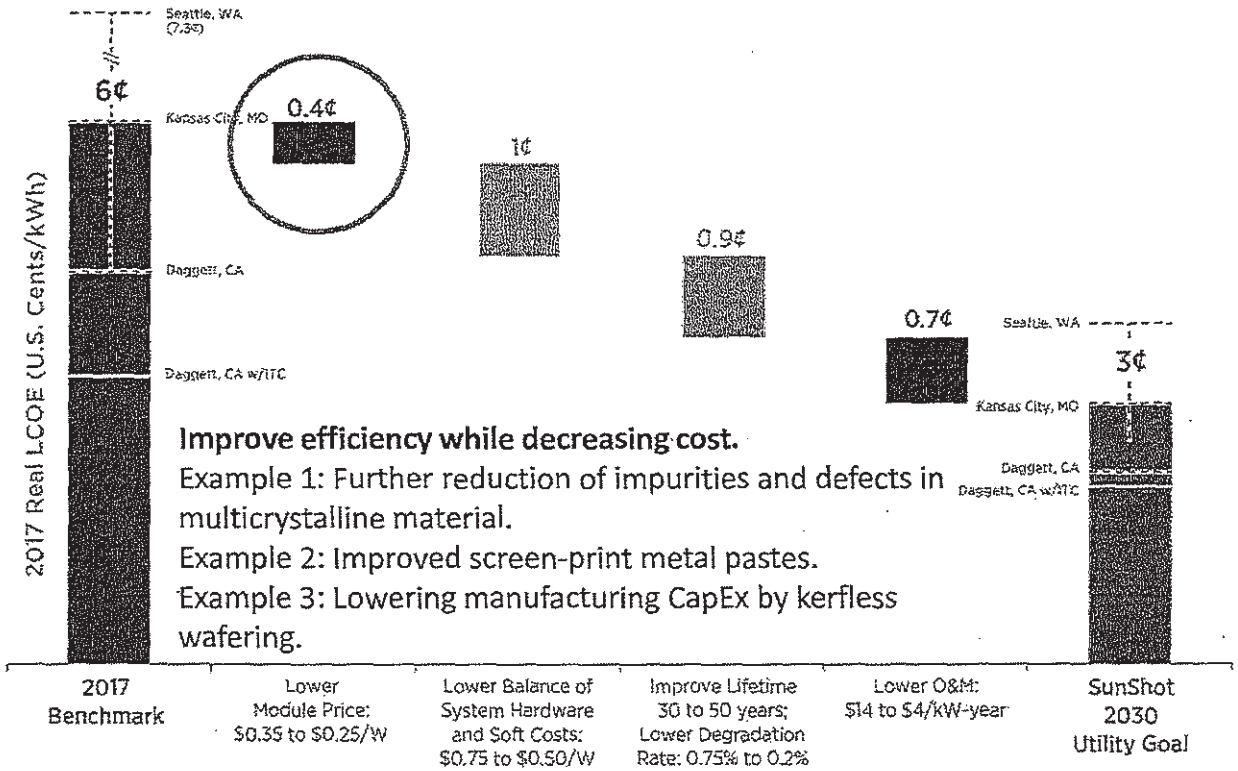
- PVRD2 (2017, $25M)
- DuraMat (2016, $30M)
- PVRD (2016, $17M)
- PVRD-SIPS (2016, $2M)
- Natl. Labs (SuNLaMP 2016-18, $103M)
- PREDICTS 2 (2015, $10M)
- Next Gen 3 (2014, $15M)
- DISTANCE (2013, $1M)
- F-PACE 2 (2013, $16M)
- PREDICTS (2013, $2.5M)
- Natl. Labs (LPDP, 2013-15, $95M)
- SERIIUS (2012, $6.2M)
- BRIDGE (2012, $8M)
- F-PACE (2011, $30M)
- Next Gen 2 (2011, $23M)
- QESST (2011 - 20, $18M)
- MURA (2010, $2M)

What are the Opportunities for Module Innovation?



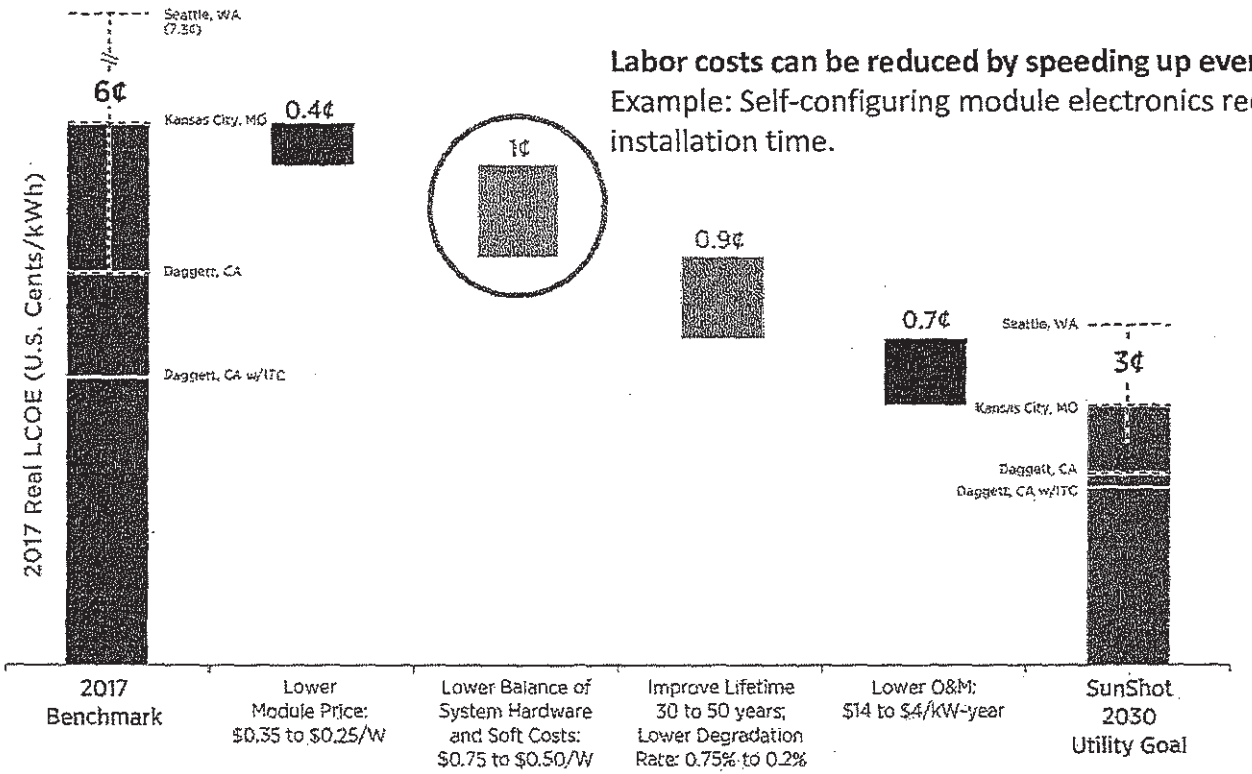
Source of Figure: NREL

A Pathway To 3 Cents per kWh for Utility PV



100 $MW_{(DC)}$ One-Axis Tracking Systems With 1,860 $kWh_{(AC)}/kW_{(DC)}$ First-Year Performance. Includes 5 Year MACRS. Horizontal Lines Indicate Low, Median, and High U.S. Solar Resources.

A Pathway To 3 Cents per kWh for Utility PV



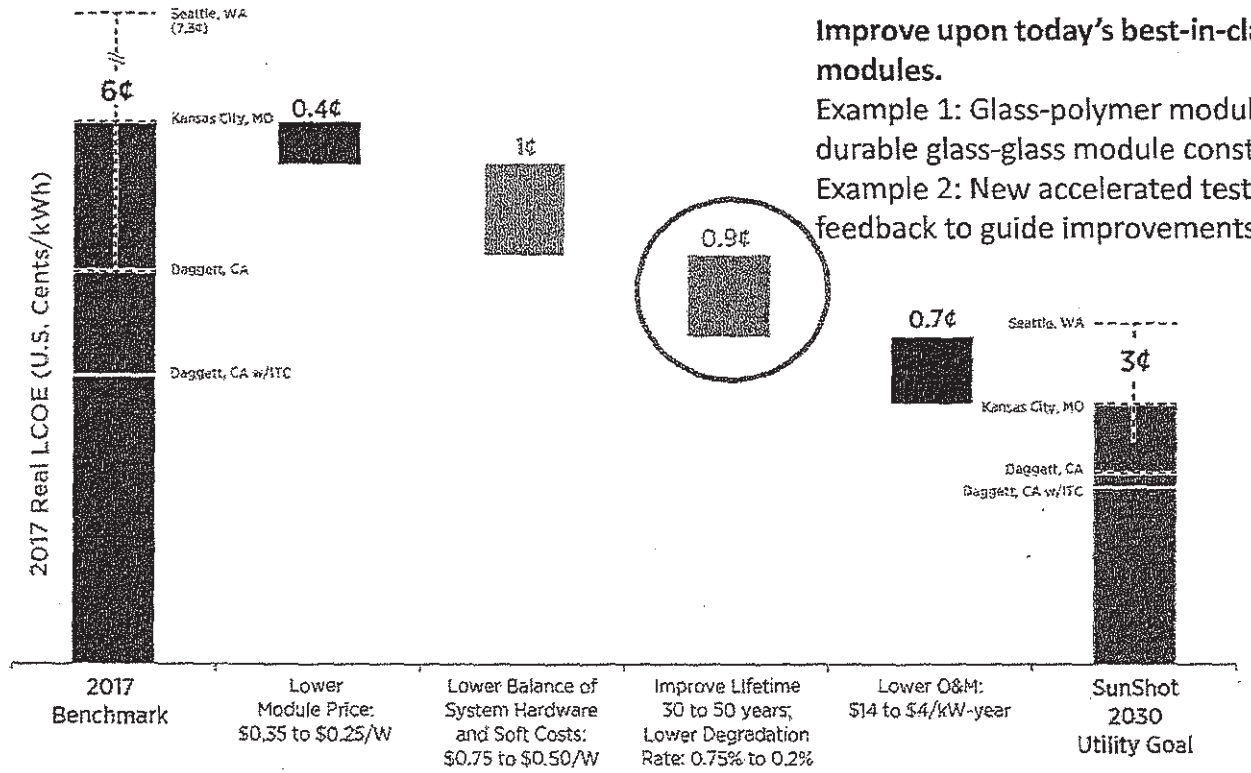
Labor costs can be reduced by speeding up every step.
Example: Self-configuring module electronics reduce installation time.

energy.gov/solar-off

100 $MW_{(DC)}$ One-Axis Tracking Systems With 1,860 $kWh_{(AC)}/kW_{(DC)}$ First-Year Performance. Includes 5 Year MACRS. Horizontal Lines Indicate Low, Median, and High U.S. Solar Resources.

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A Pathway To 3 Cents per kWh for Utility PV



Improve upon today's best-in-class reliability in *low-cost* modules.

Example 1: Glass-polymer modules can transition to more durable glass-glass module construction.

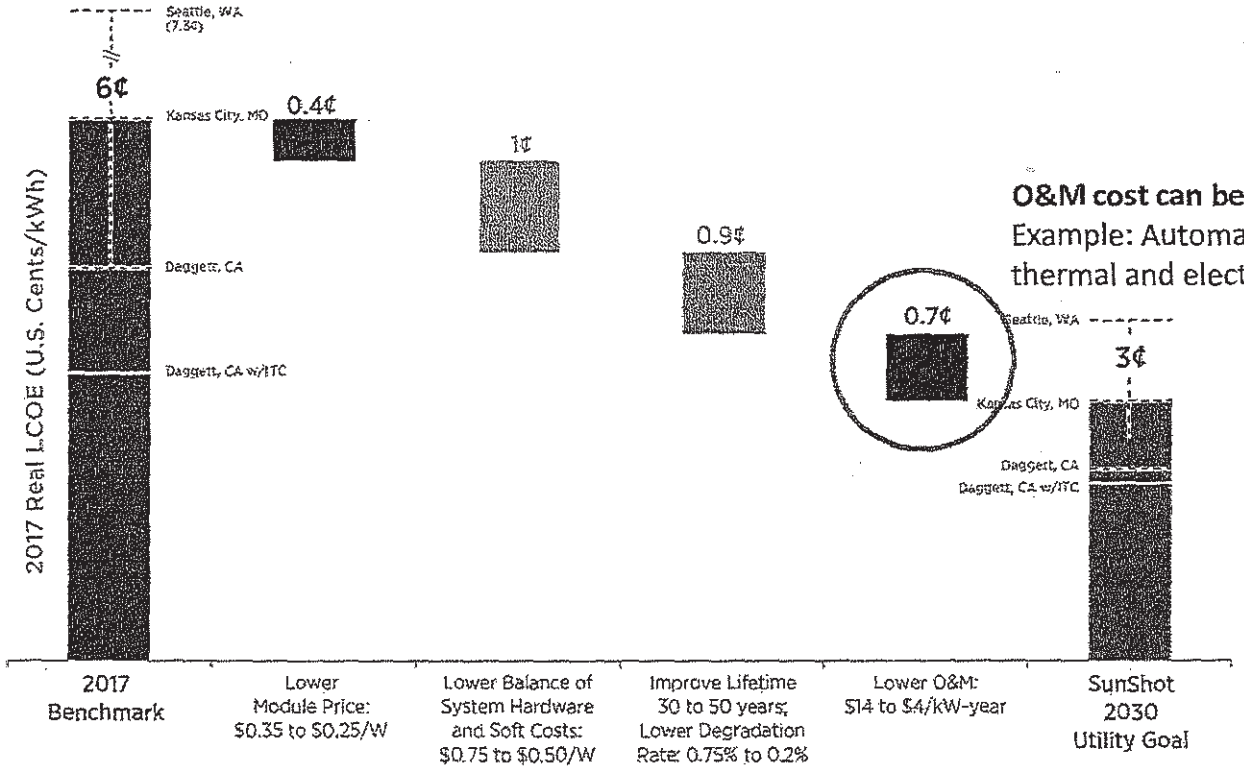
Example 2: New accelerated testing methods to provide rapid feedback to guide improvements in module durability.

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100 $MW_{(DC)}$ One-Axis Tracking Systems With 1,860 $kWh_{(AC)}/kW_{(DC)}$ First-Year Performance. Includes 5 Year MACRS. Horizontal Lines Indicate Low, Median, and High U.S. Solar Resources.

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A Pathway To 3 Cents per kWh for Utility PV



O&M cost can be reduced by automation.
Example: Automated field inspection by thermal and electroluminescence imaging.

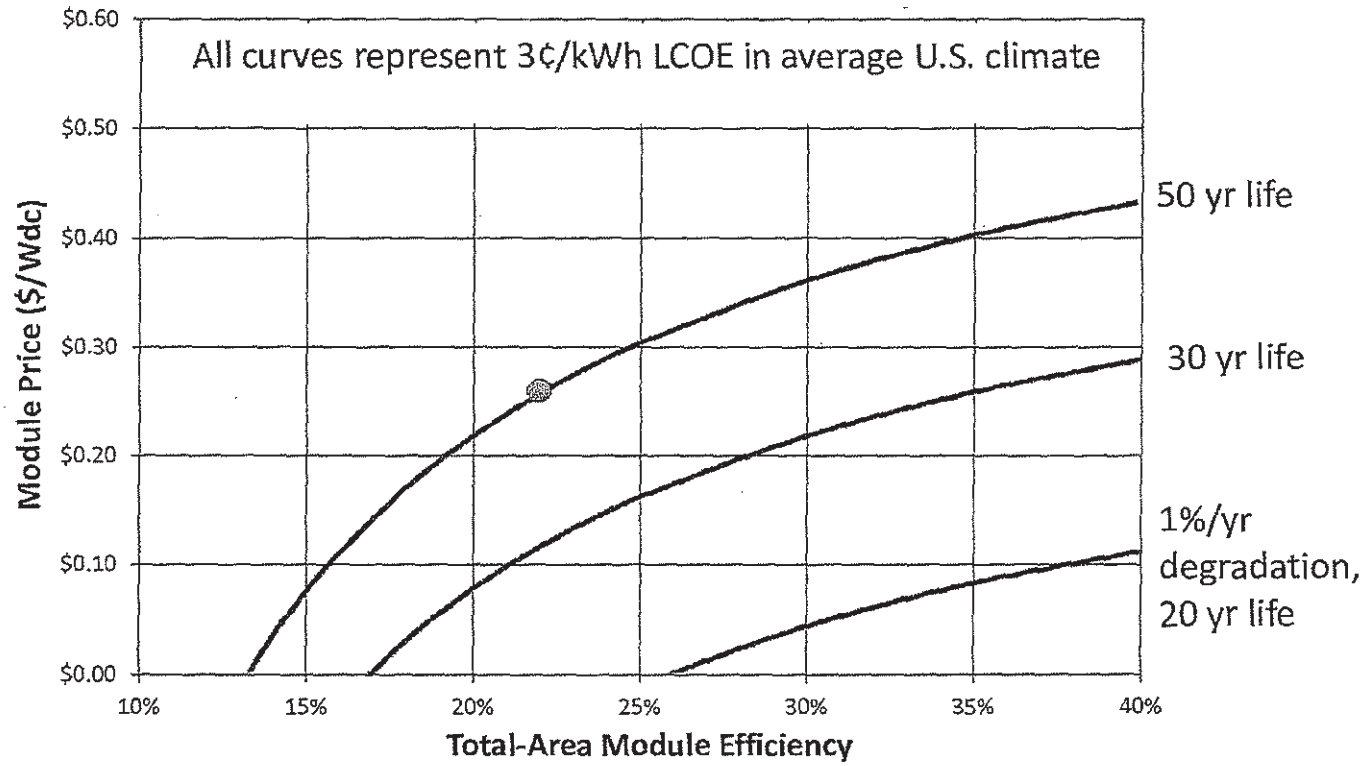
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100 $MW_{(DC)}$ One-Axis Tracking Systems With 1,860 $kWh_{(AC)}/kW_{(DC)}$ First-Year Performance. Includes 5 Year MACRS. Horizontal Lines Indicate Low, Median, and High U.S. Solar Resources.

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There are Many Technology Pathways to $0.03/kWh

- Cost and performance tradeoffs open up numerous pathways.
- All pathways require sustained, multifaceted innovation.

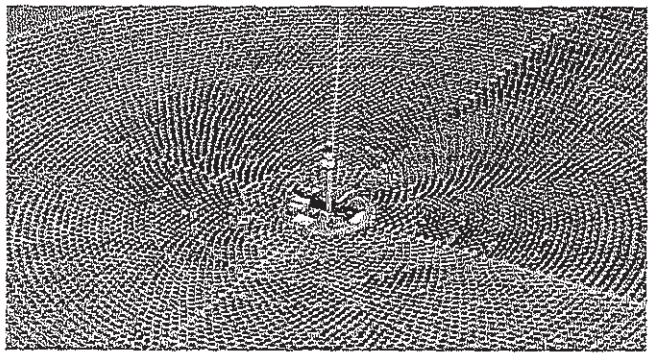


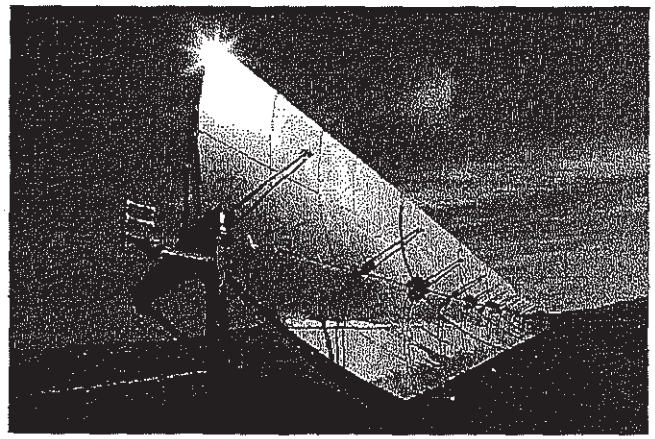
Scenarios assume: 7% WACC, 2.5% inflation, $4/kW-yr O&M, 21% capacity factor

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CSP is Deployed Worldwide





4.8 GW CSP deployed globally

1.8 GW CSP deployed in the U.S.

0.4 GW CSP deployed in the U.S. *with storage*

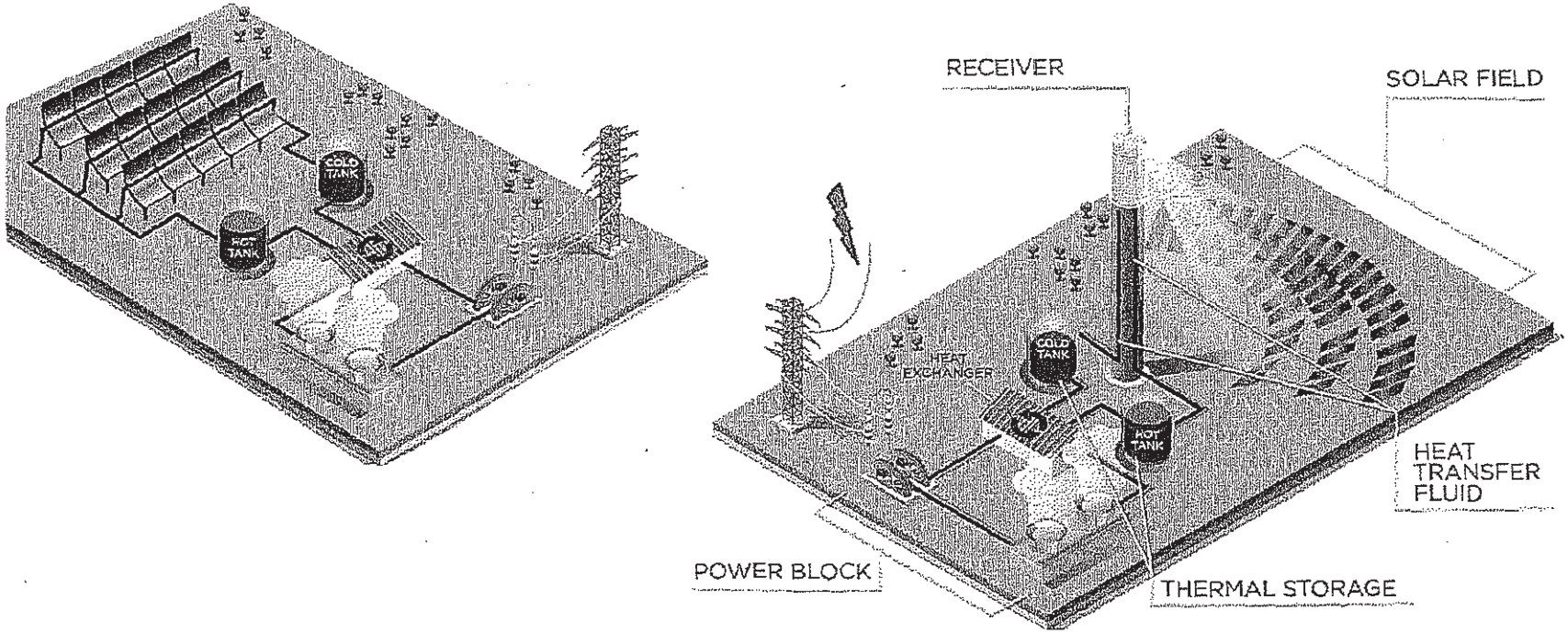
Since 2016 CSP's share of electricity generation:

- 1% of California
- 2% of Spain

energy.gov/solar-office

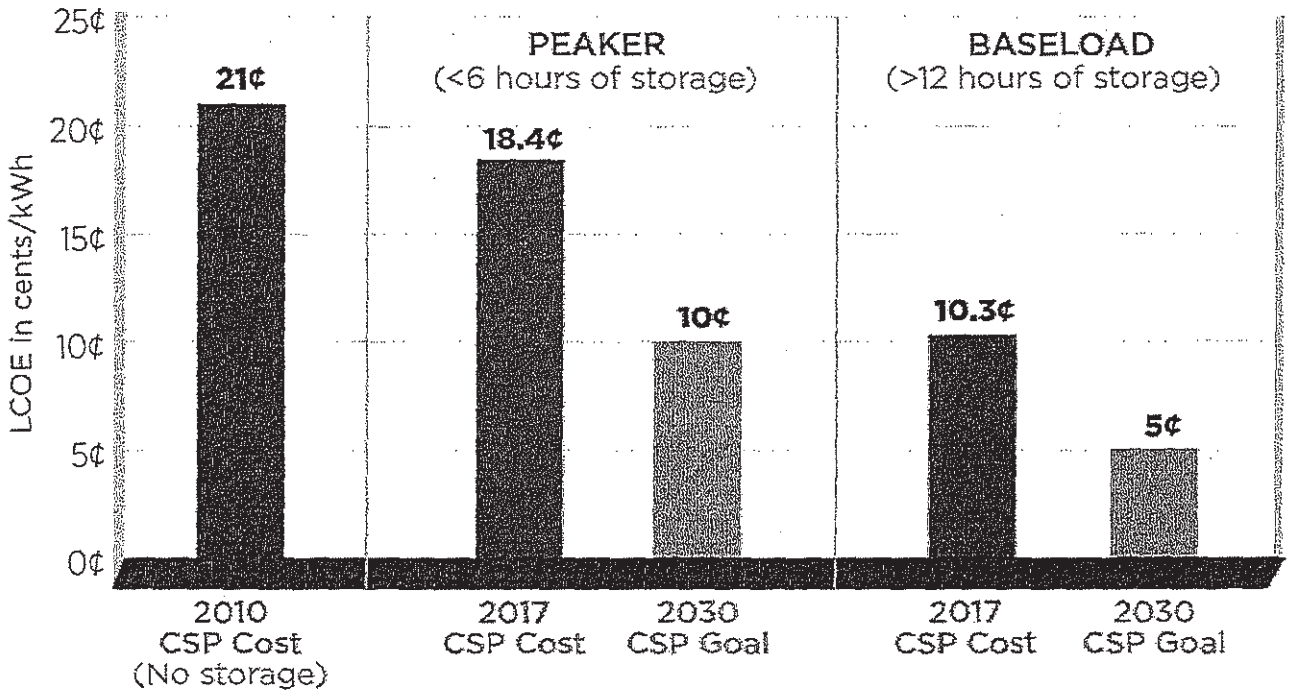
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U.S. Department Of Energy

CSP with Storage is Solar Energy On-Demand



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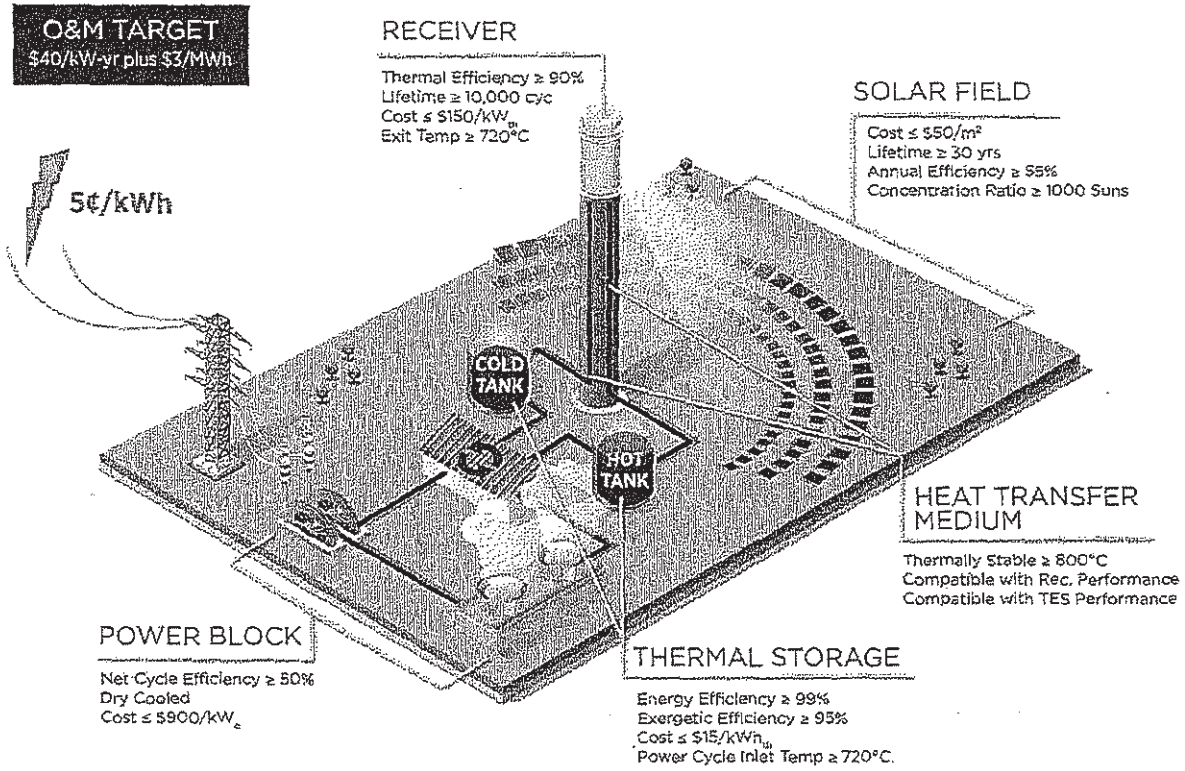
2030 Levelized Cost of Electricity Targets



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CSP Program Technical Targets



Collector Field
- Optical Physics
- Structural design and dynamics
- Manufacturing and automation
- Sensors and control

Receivers
- Optical properties
- Coatings
- High temperature materials
- Chemistry
- Heat Transfer, Fluid Mechanics

TES and HTF
- Chemistry
- High temperature materials
- Materials Science
- Heat Transfer, Fluid Mechanics

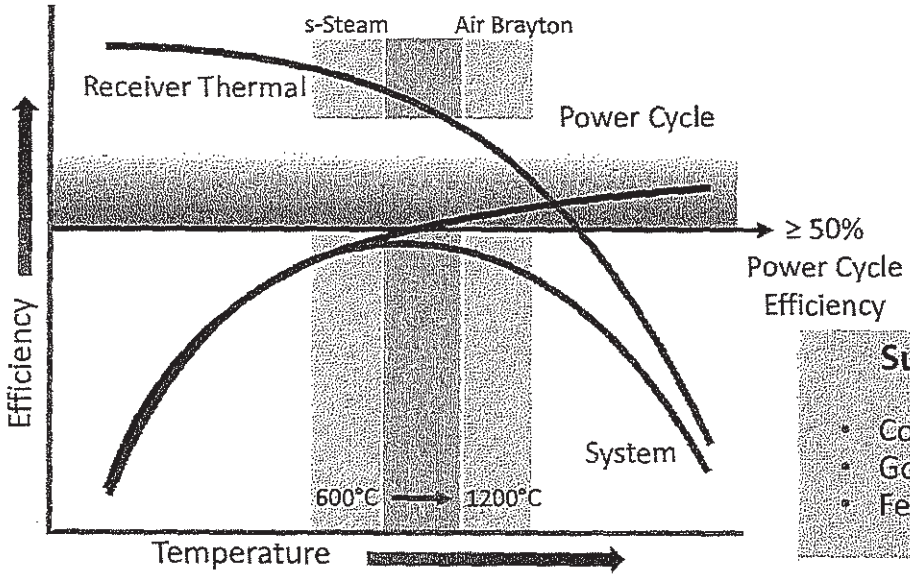
Power Block
- High temperature materials
- Turbomachinery
- Manufacturing and automation
- Sensors and control

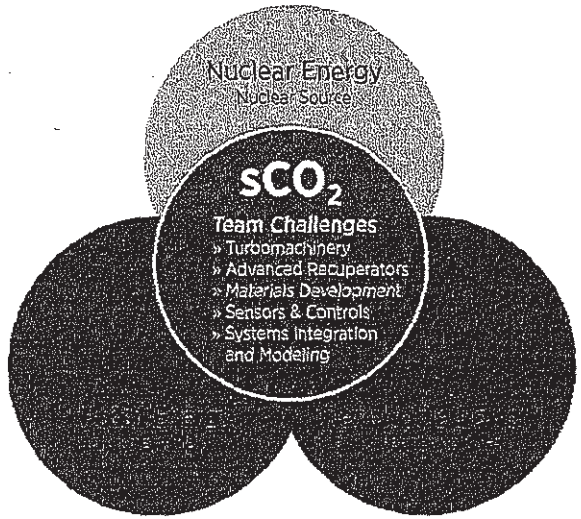
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Next Generation CSP will Leverage Next Generation Power Cycles

$$\eta_{Cycle} = 1 - \frac{T_C}{T_H} \quad vs. \quad Q_{Radiative} \, \alpha \, T^4$$



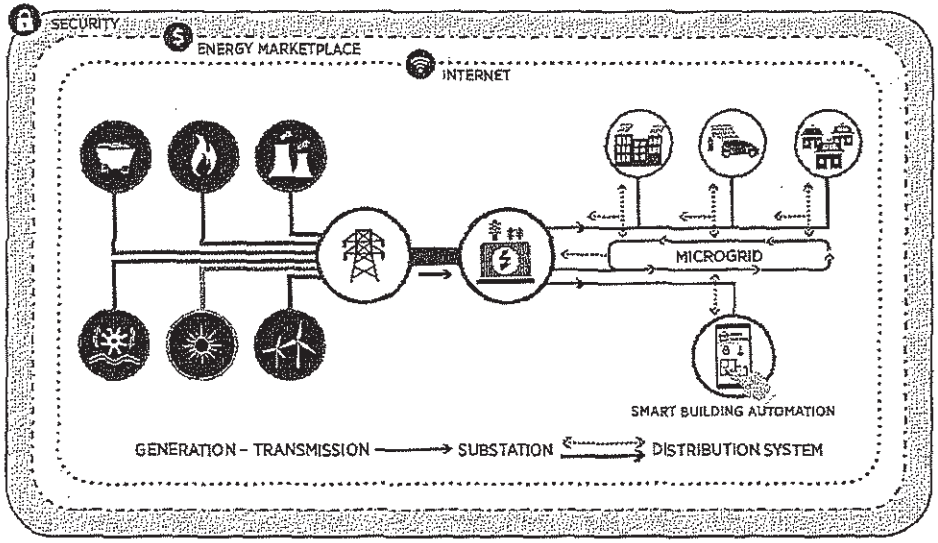


Supercritical CO_2 is a dense, compressible fluid:

- Compact turbomachinery
- Good compatibility with dry cooling
- Fewer loss mechanisms and parasitics

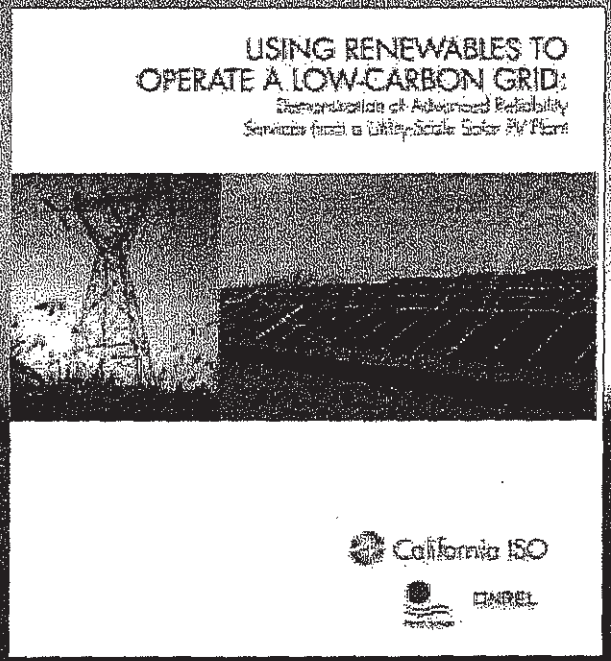
System Integration

- Fund research projects to develop innovative technical solutions that enable large scale deployment of solar power onto a modernized electricity grid focusing on ***reliability, resilience, and cybersecurity***
- Part of DOE Grid Modernization Initiative (GMI) and collaborate closely with national labs through Grid Modernization Laboratory Consortium (GMLC)



Tests Successfully Conducted on 300 MW Solar PV plant

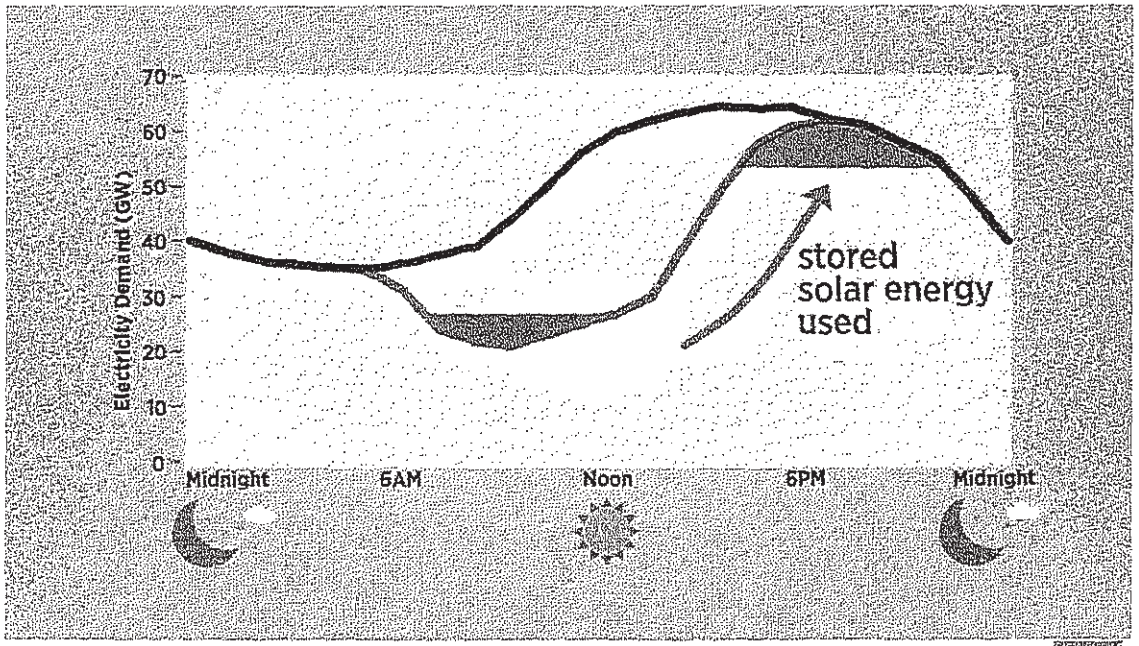
- Power Ramping
  - ✓ Ramp its real-power output at a specified ramp-rate
  - ✓ Provide regulation up/down service
- Voltage Control
  - ✓ Control a specified voltage schedule
  - ✓ Operate at a constant power factor
  - ✓ Produce a constant level of MVAR
  - ✓ Provide controllable reactive support (droop setting)
  - ✓ Provide reactive support at night
- Frequency
  - ✓ Provide frequency response for low frequency & high frequency events
  - ✓ Control the speed of frequency response
  - ✓ Provide fast frequency response



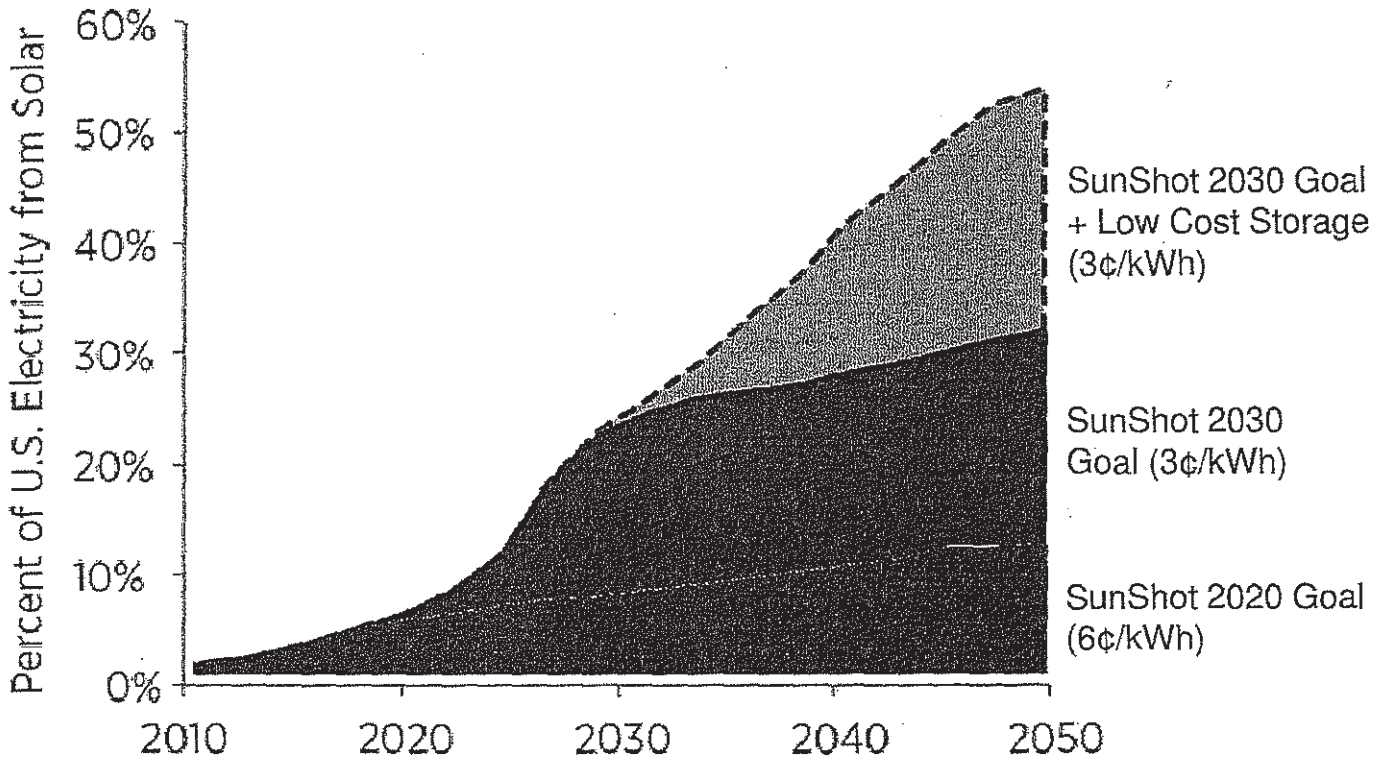
Utility-Scale PV Plant Contributes to Grid Stability & Reliability Like Conventional Generation

SETO's Expanding Focus: Solar-on-demand

Making solar available when energy is needed is the next critical challenge and represents an opportunity for solar to support the nation's energy resilience.

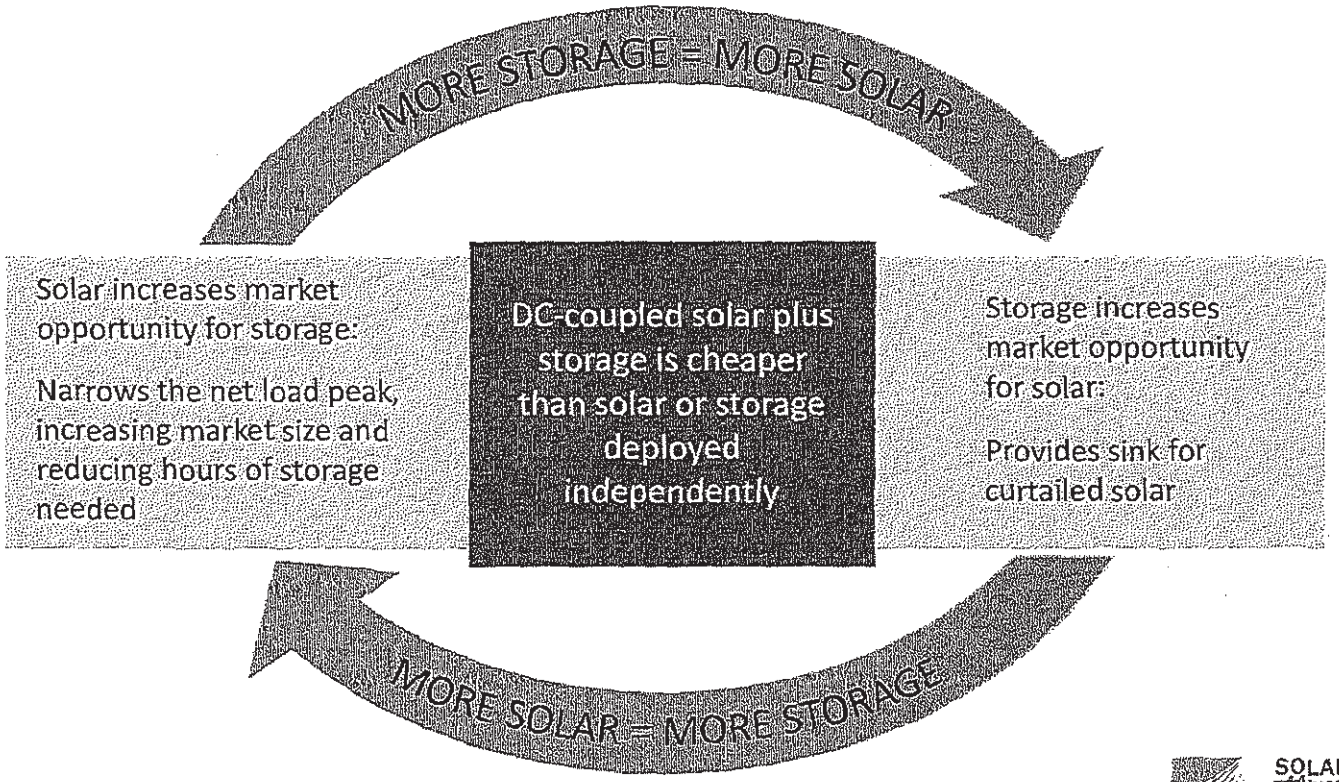


Half the Cost, More than Double the Solar



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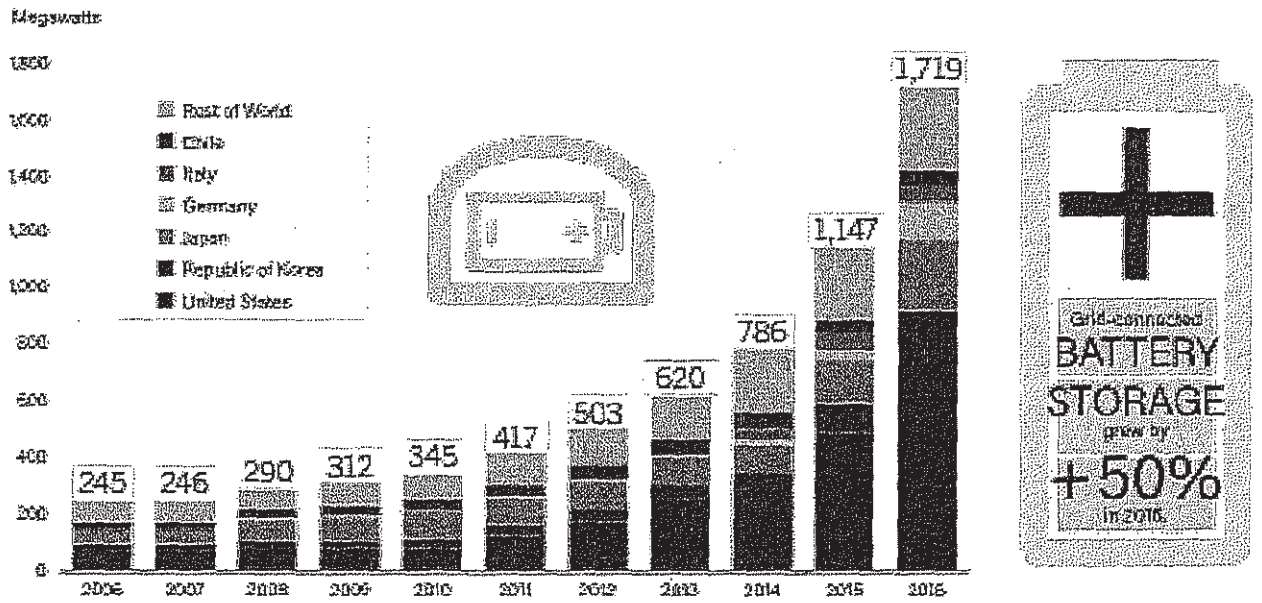
Solar-Storage Synergy



Slide content courtesy of Paul Denholm, NREL

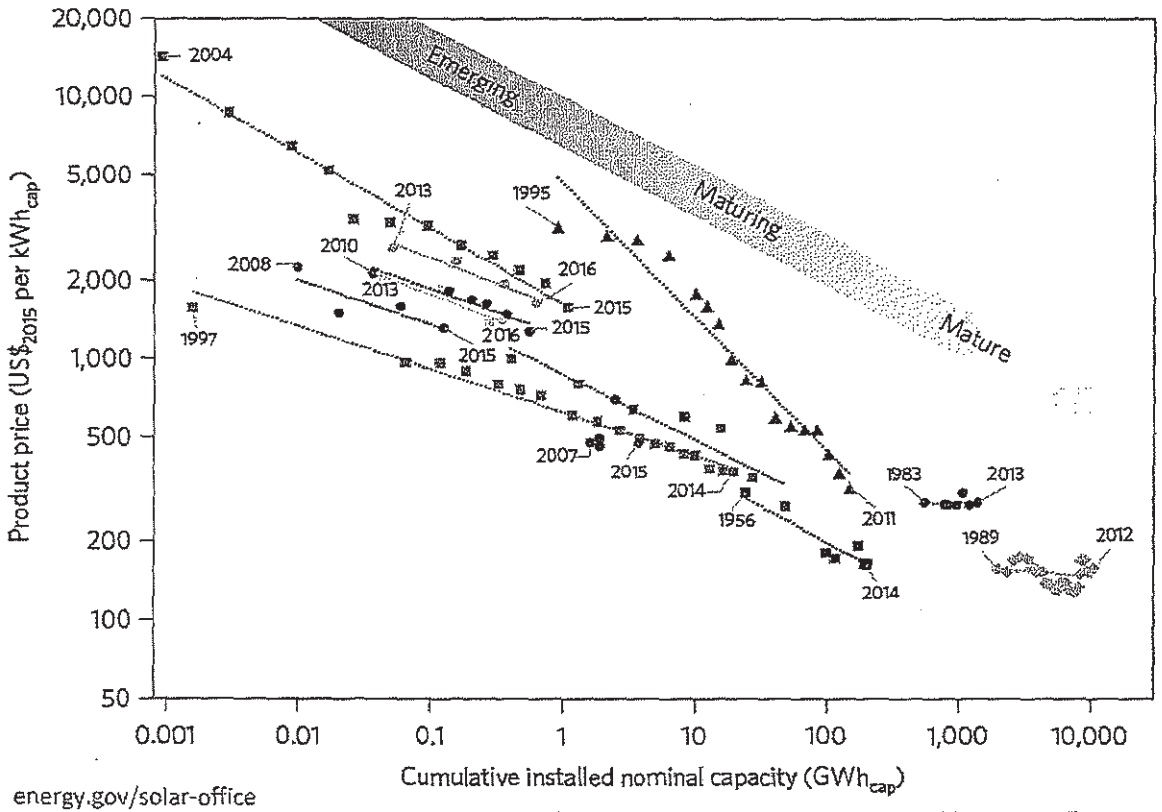
Growth of Storage

Global Grid-Connected Stationary Battery Storage Capacity, by Country, 2006-2016



Source: REN21 Renewables 2017 Global Status Report

Experience Curves for Energy Storage

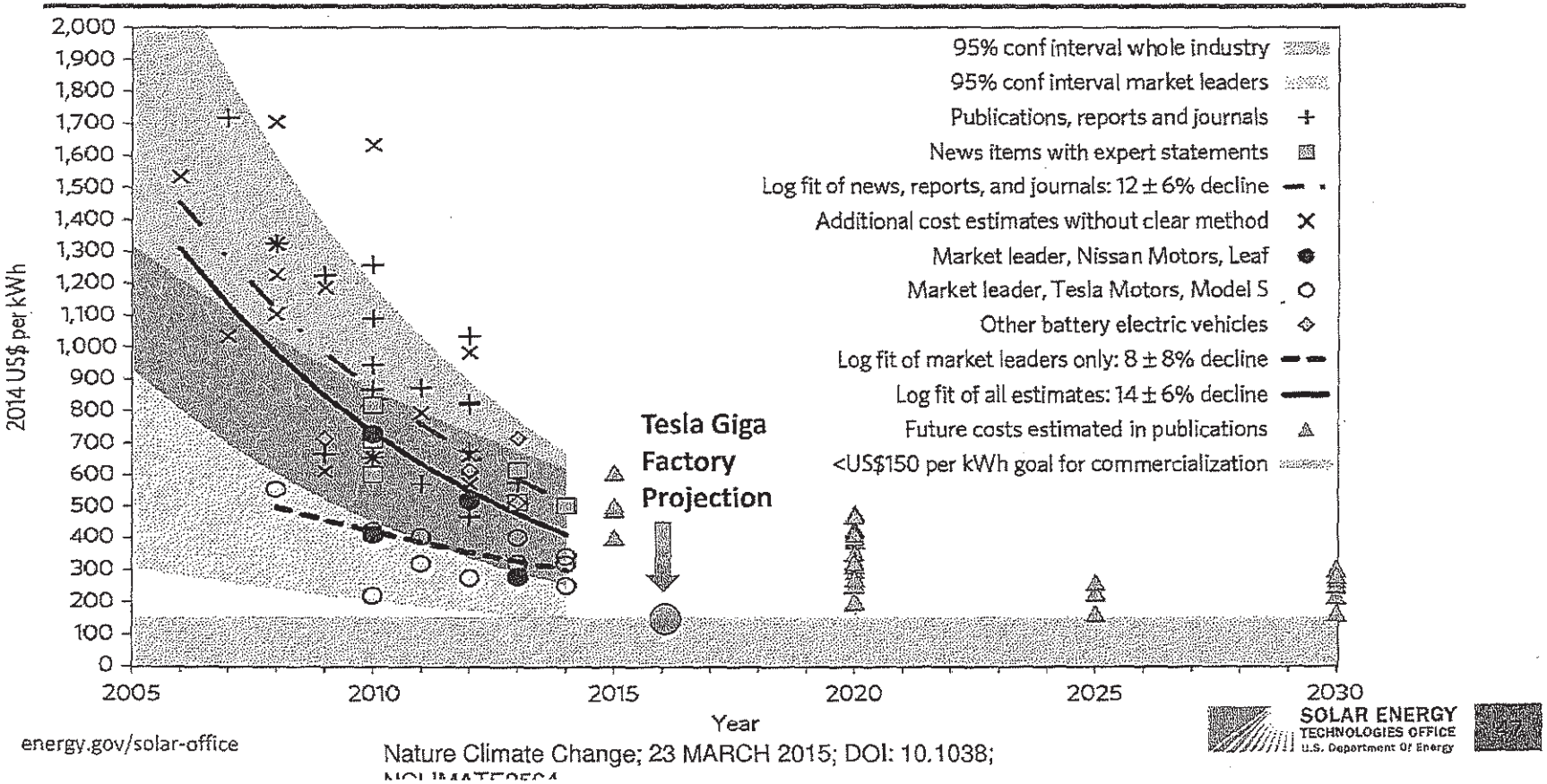


- System ■ Pack ◆ Module ▲ Battery
- Pumped hydro (utility, −1 ± 8%)
- Lead-acid (multiple, 4 ± 6%)
- Lead-acid (residential, 13 ± 5%)
- Lithium-ion (electronics, 30 ± 3%)
- Lithium-ion (EV, 16 ± 4%)
- Lithium-ion (residential, 12 ± 4%)
- Lithium-ion (utility, 12 ± 3%)
- Nickel-metal hydride (HEV, 11 ± 1%)
- Sodium–sulfur (utility, -).
- Vanadium redox-flow (utility, 11 ± 9%)
- Electrolysis (utility, 18 ± 6%)
- Fuel cells (residential, 18 ± 2%)

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Nature Energy 10 JULY 2017, VOLUME: 2, ARTICLE NUMBER: 17110

Lithium Ion Battery Pack Costs / Projections : EV

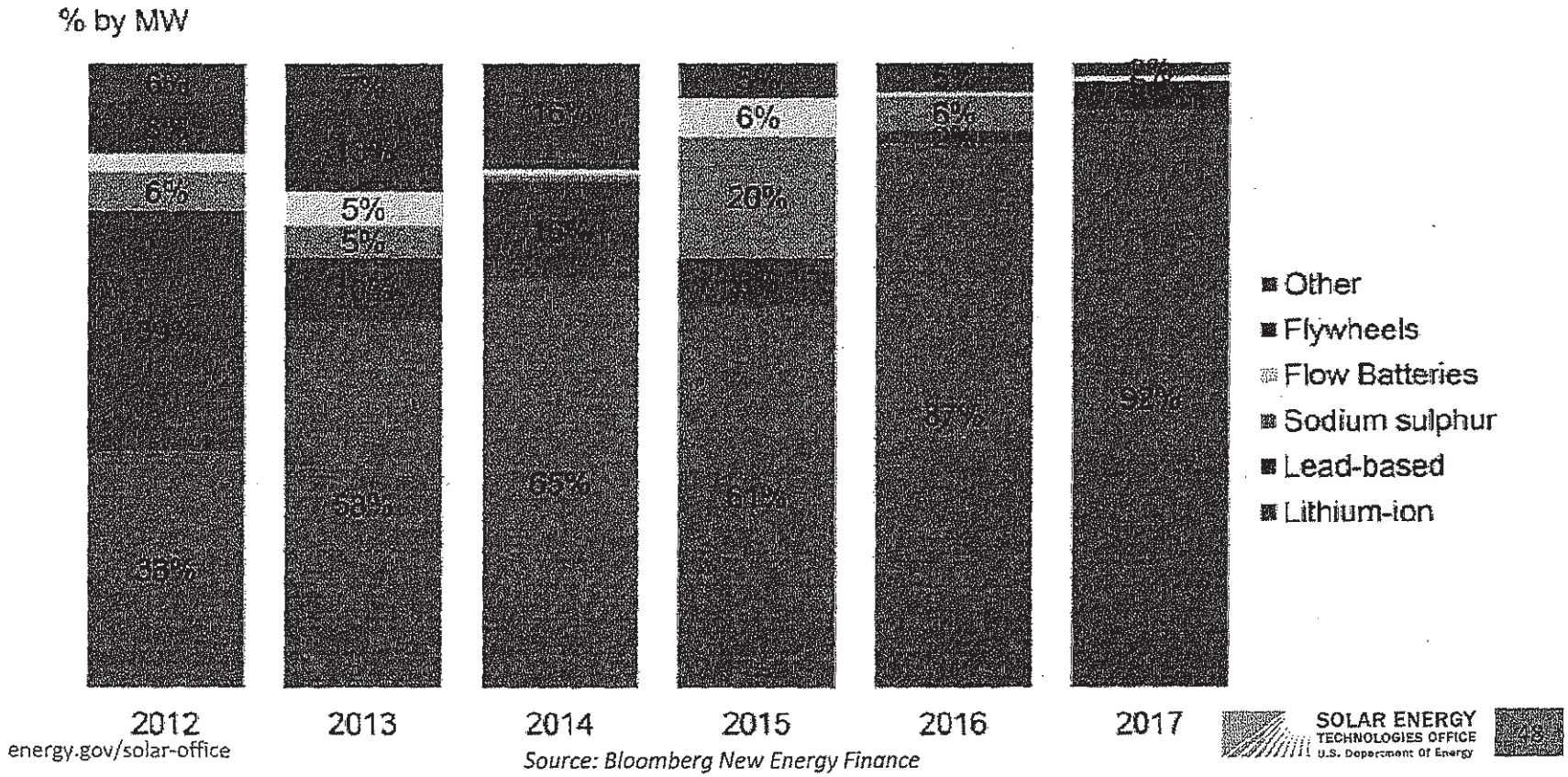


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Nature Climate Change; 23 MARCH 2015; DOI: 10.1038;

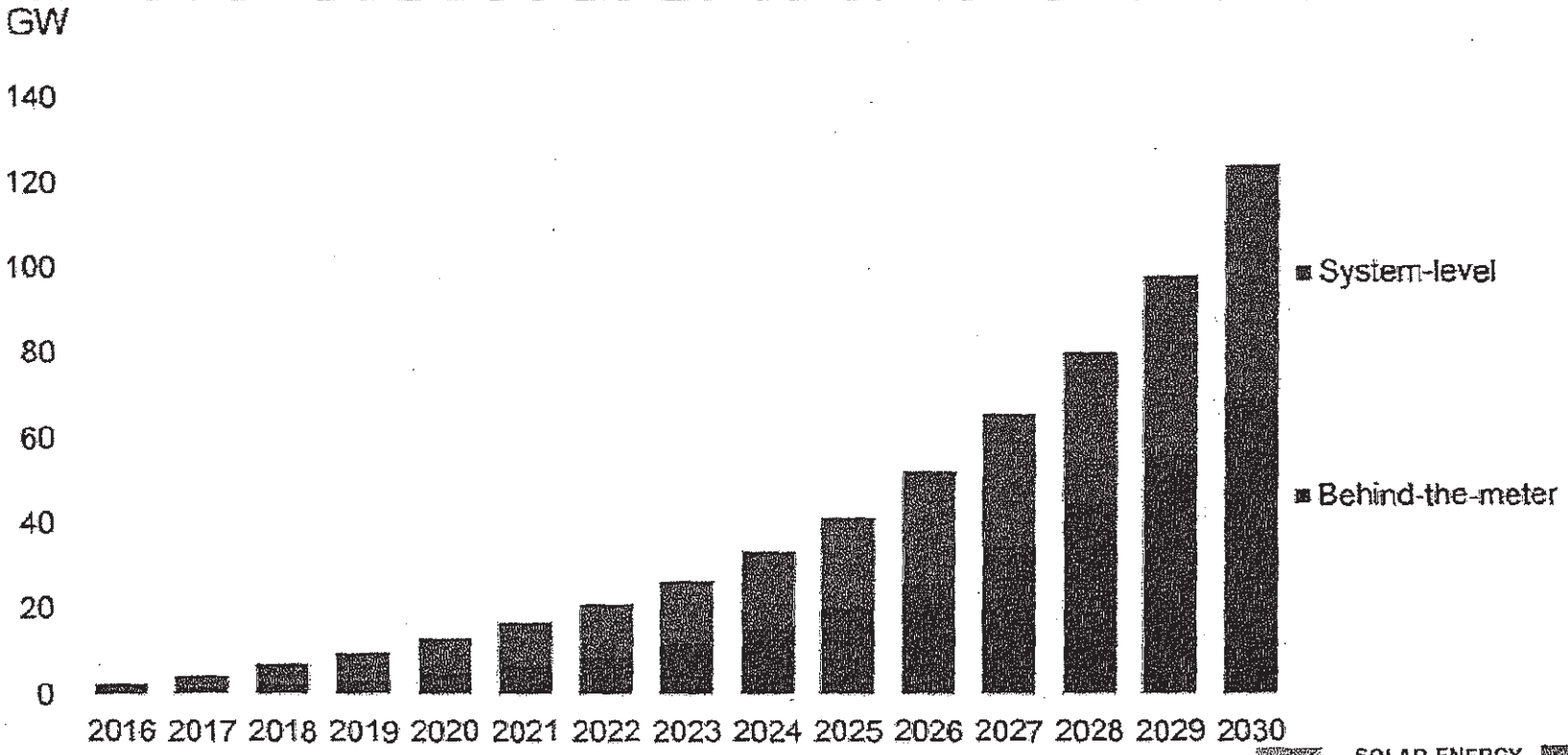
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U.S. Department Of Energy

Technology mix of globally commissioned utility-scale energy storage



Source: Bloomberg New Energy Finance

Global energy storage will increasingly be behind-the-meter



Source: Bloomberg New Energy Finance. Note: System-level refers to projects that provide system services independent of where they are connected to the grid.

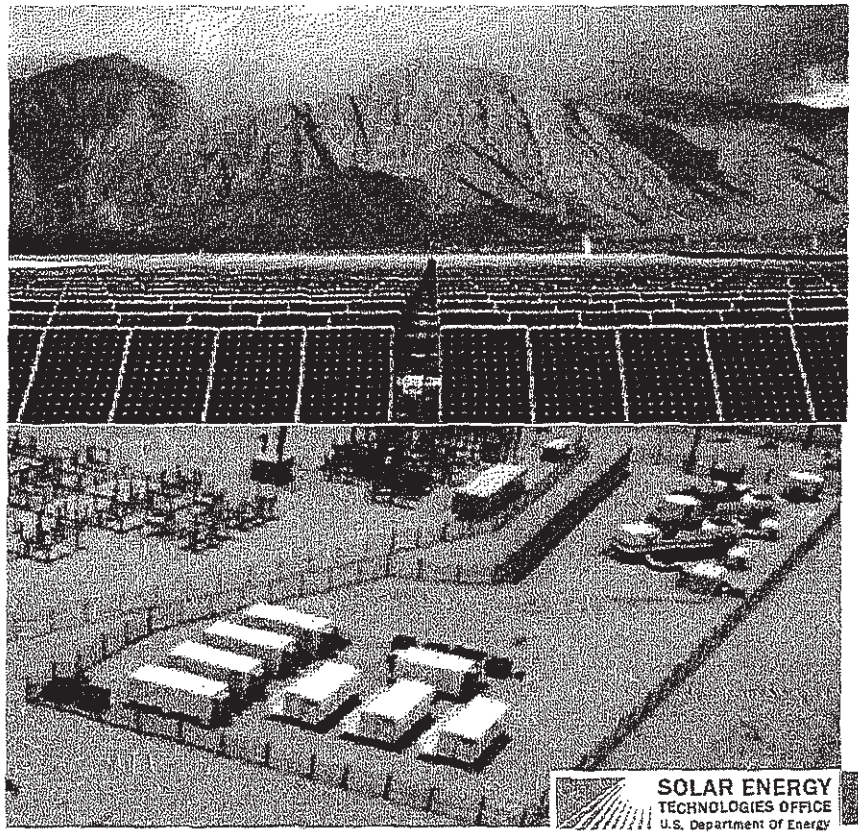
Connections : Why Beyond Batteries ?

- Electricity is not easily stored in native form
- Need to convert to some other form (chemical, mechanical, thermal) to store energy

- There are alternatives to energy storage
  - Generator ramping (constrained by min/max operational levels and ramp speed)
  - Load ramping (constrained by customer needs)
  - Geographic electricity moving/shifting (transmission)

Microgrid Example: Borrego Springs, CA

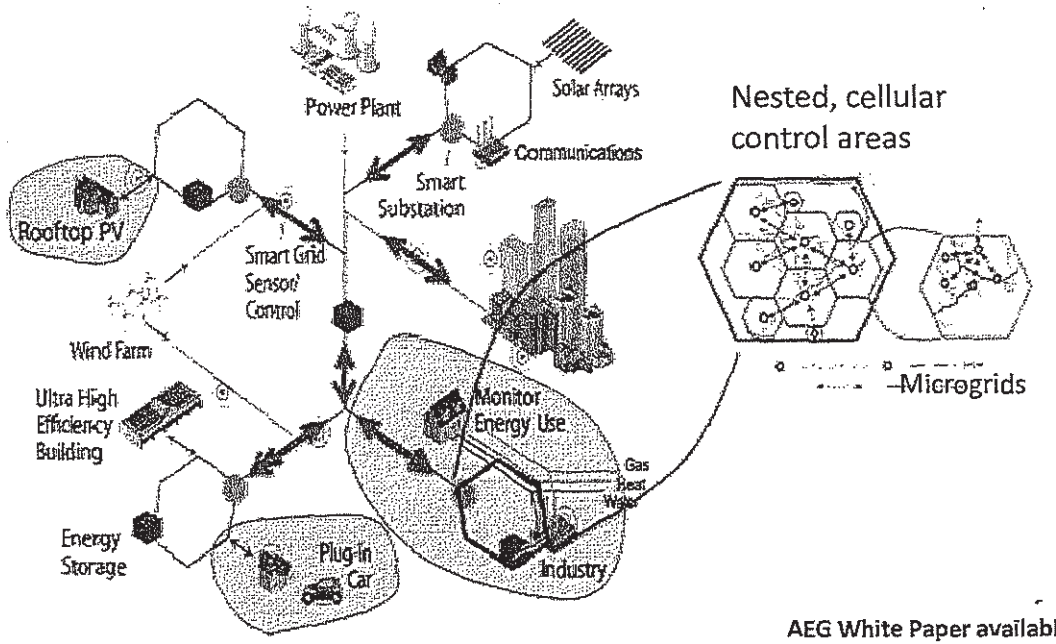
- 10 hour outage to entire community required to perform compliance-driven transmission maintenance and to replace 2 suspect transmission poles
- Utilized Borrego Springs Microgrid to keep all 2800 customers energized during transmission outage
- Base load was fed by the solar facility, using the batteries and distributed generation to "follow the load"
- Customers experienced a brief 10 minute planned outage to reconnect to the transmission grid



Autonomous Energy Grids (AEGs)

Optimized for secure, resilient and economic operations

Central-station based Grid

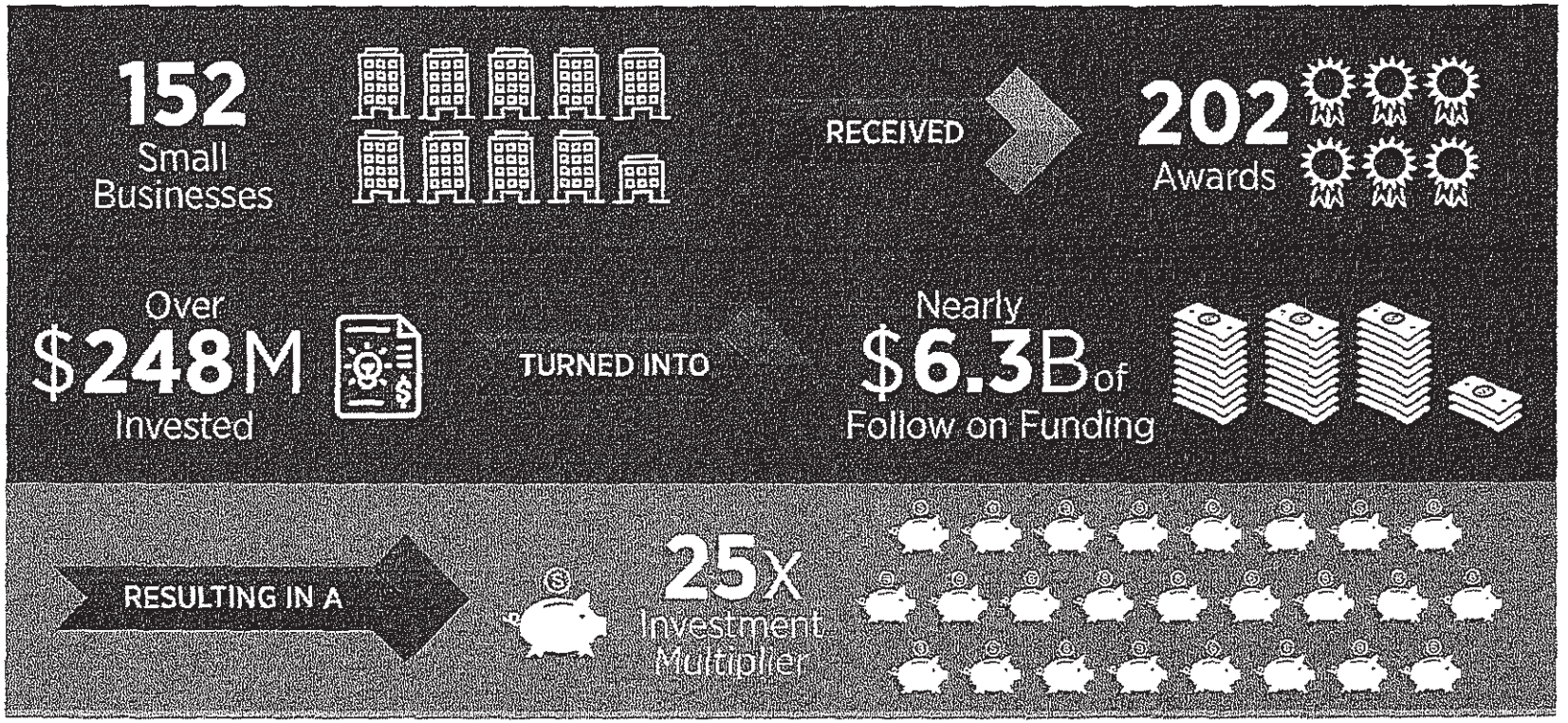


Key Features of AEGs

- **Autonomous** – Makes decisions without operators
- **Resilient** – Self-reconfiguring, cellular building blocks, able to operate with and without communications
- **Secure** – Incorporates cyber and physical security against threats
- **Reliable and Affordable** - Self optimizes for both economics and reliability
- **Flexible** – Able to accommodate energy in all forms including variable renewables

AEG White Paper available at:
https://www.nrel.gov/docs/fy18osti/68712.pdf

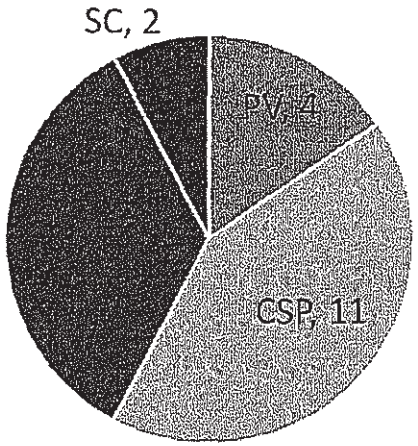
Private Sector Taking Innovation to Market (since 2007)



SBIR/STTR

Recognize small businesses for rapid innovation & commercialization, and having a more diverse workforce than large companies, universities, and government. Increase the speed of commercialization

- No cost-share. Program structured into two phases
- DOE-level program
- 3.65% of the office R&D budget

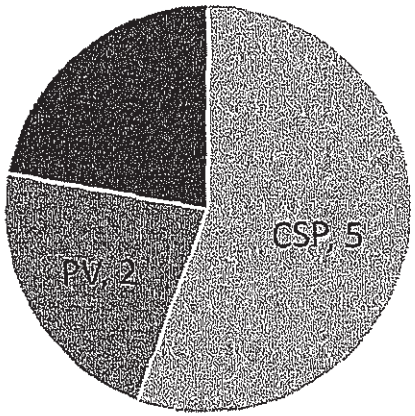


SBIR·STTR
America's Seed Fund

SMALL BUSINESS VOUCHER PILOT:

Small businesses apply to work with the National Laboratories on modeling, evaluation, validation, and technology development.

- 20% cost share required
- EERE-level program
- 9 projects funded in 3 program rounds (since 2016)



RPC

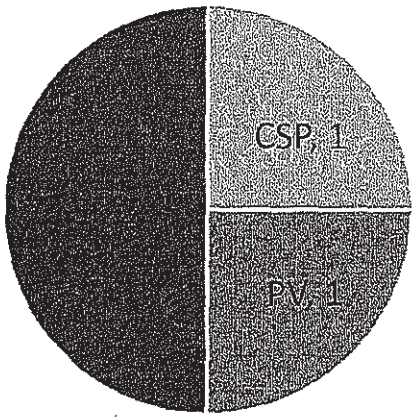
Sandia National Laboratories

Renewable Power Conversion, Inc.
Advanced Functionality Testing of Modular PV Inverter

TECHNOLOGY COMMERCIALIZATION FUND:

National Laboratory projects to mature and commercialize lab-developed energy-relevant technologies and products.

- 50% cost share required, industry partners required for 2nd tier projects
- DOE-level program
- 4 projects funded in 2 program rounds (since 2016)



Pacific Northwest NATIONAL LABORATORY

NREL NATIONAL RENEWABLE ENERGY LABORATORY

Lawrence Livermore National Laboratory

GridUnity

EATON

Innovative Pathways

- ***Innovative Pathways aims to research and develop new mechanisms that could change HOW innovative energy technologies reach the market***
- 11 funded projects will pilot and test new approaches to:
  1. Lower barriers to innovator-corporate partnerships
  2. Spur new investment in early-stage energy innovation

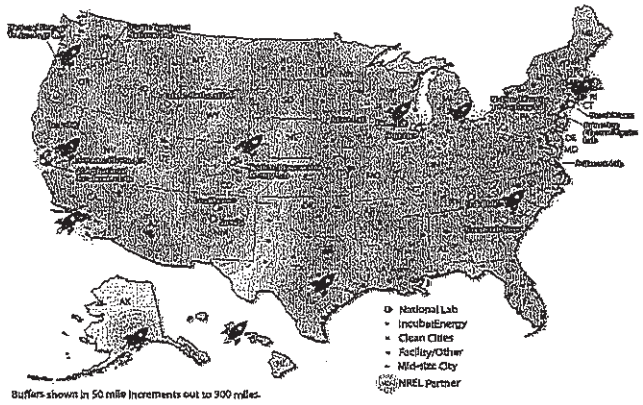
SETO Funded

PECAN STREET

clean energy trust

ACTIVATE

POWERHOUSE



EERE Funded

CASE WESTERN RESERVE UNIVERSITY 1826

ACTIVATE

RhoAI

Prime

AiiM

Alpha Impact Investment Management Partners

LACI

ADL VENTURES

Office of Management and Budget Guidance

EXECUTIVE OFFICE OF THE PRESIDENT

WASHINGTON, D.C.

August 17, 2017

M-17-30

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: MICK MULVANEY
DIRECTOR, OFFICE OF MANAGEMENT AND BUDGET

MICHAEL KRATSIOS
DEPUTY ASSISTANT TO THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: FY 2019 Administration Research and Development Budget Priorities

Office of Management and Budget Guidance

American Security

Special attention should be paid to R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership.

American Energy Dominance

Development of domestic energy sources should be the basis for a clean energy portfolio composed of fossil, nuclear, and renewable energy sources. Agencies should invest in early-stage, innovative technologies that show promise in harnessing American energy resources safely and efficiently. As initiated in the FY 2018 budget, Federally-funded energy R&D should continue to reflect an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies.

Modernizing and Managing Research Infrastructure

Innovative partnership models involving other agencies, state and local governments, the private sector, academia, and international partners can help maximize utilization of underused facilities and lead to sharing the costs of new R&D facilities.

American-Made Challenges

Department of Energy Announces Prize Competition to Accelerate U.S.-Based Solar Manufacturing

JANUARY 24, 2018

American-Made Challenges

American-Made Solar Prize

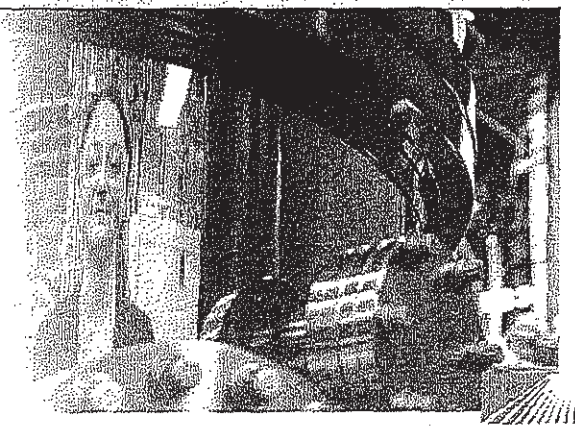
Manufacturing Accelerator for Domestic Energy in the U.S.

The U.S. Department of Energy (DOE) Solar Energy Technologies Office and the National Renewable Energy Laboratory (NREL) are working together to launch the first prize challenge associated with the American-Made Challenges.

The **American-Made Solar Prize (Solar Prize)**:

- Accelerates the development of technologies and solutions that will advance the solar industry
- Enables rapid prototyping of ground-breaking solar solutions and prove their viability
- Provides connections to a network of solar industry experts, fabricators, and developers
- Connects entrepreneurs with the investor community to help solar businesses and technical solutions scale

Pre-registration is now open!

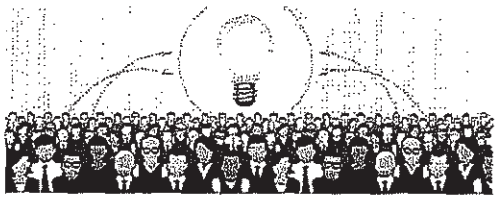


energy.gov/solar-office

American-Made Challenges: Solar Prize

A more effective way of accelerating technologies to commercial relevance

Industry, crowd sourced ideation



Rapid development
Prizes issued on the order of months

AMERICAN MADE SOLAR PRIZE™

U.S. DEPARTMENT OF ENERGY

Activated national networks



Hardware Focus
USA Made!

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SOLAR ENERGY TECHNOLOGIES OFFICE
U.S. Department Of Energy

Key Challenges to Grid Integration of Solar Energy

Maintaining reliability with increasing distributed solar

- The electric power grid has been designed for power flow in one direction. When more solar is generated than is used locally, two-way power flows increase the complexity of system operations.

Best practices for integrating solar and distributed energy storage are all local

- Effective utilization of energy storage or load shifting is in early development.

Unpredictable variability of solar power over time

- Solar generation levels vary due to the variability of cloud cover and weather, which can cause challenges for grid optimization.

Inefficient distribution and power quality challenges

- Distribution sensing and control systems have yet to leverage advanced power electronics.

Incompatible or insecure grid-interface standards

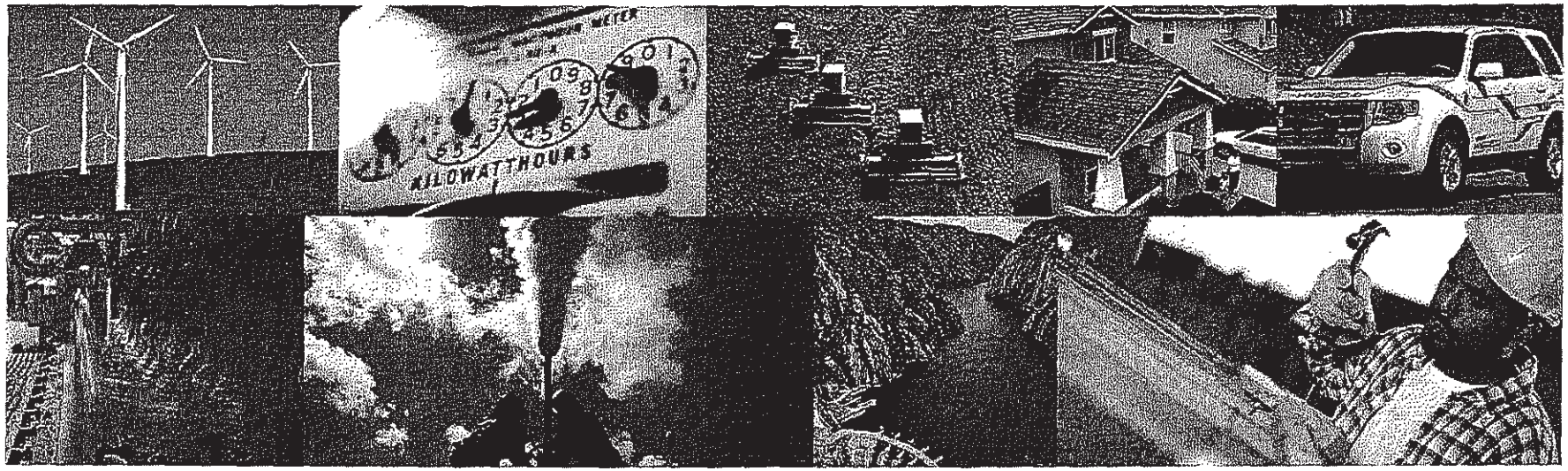
- In order for all elements of the grid to work together, communications are necessary, which makes cyber-security issues important.

U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

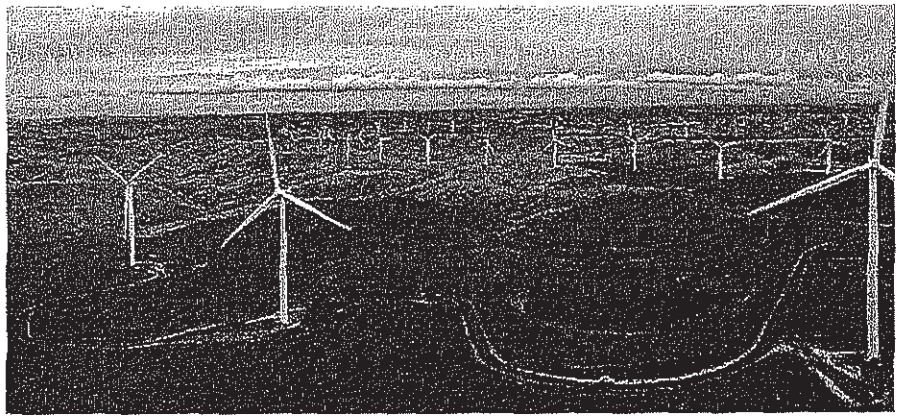
Wind Energy Technologies Office
Strategic Direction

Valerie Reed, Ph.D.
Acting Director, Wind Energy Technologies Office
Office of Energy Efficiency and Renewable Energy
April 2018



Today's Discussion Outline

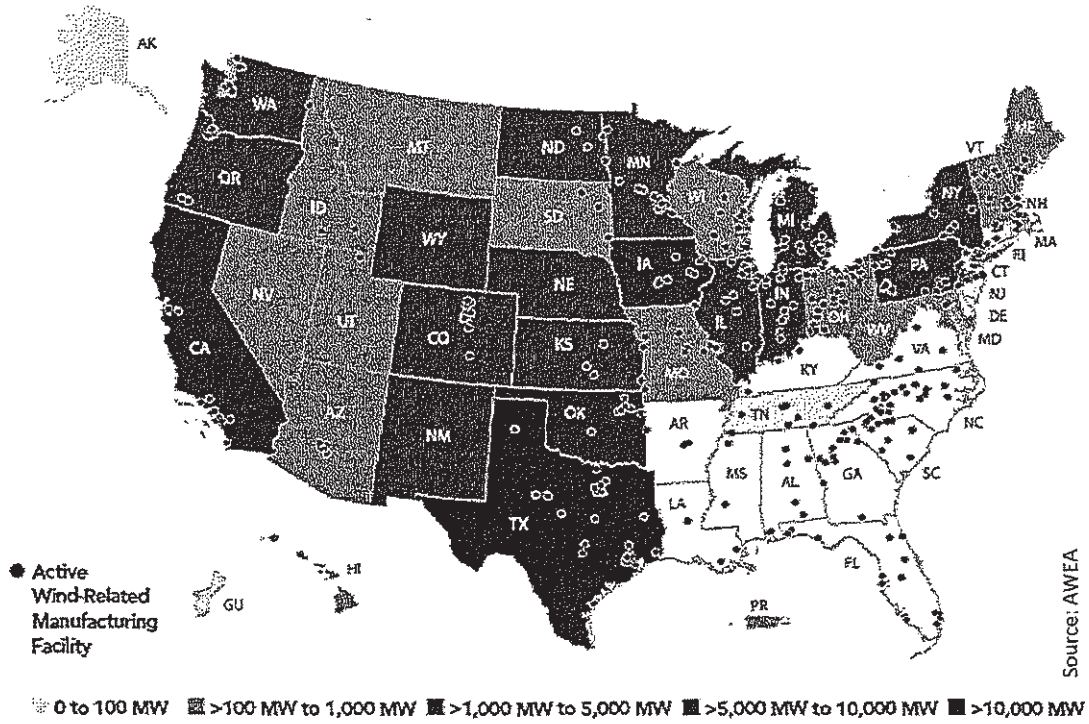
- **State of the Wind Power Industry**
- **WETO Program**
  - Program Budget Overview
  - FY 2019 Request



- **DOE Unique Role**
  - National Utility Scale Wind Strategy
  - National Offshore Wind Strategy/Demo/R&D Consortium
  - Distributed Wind Strategy
  - Market Barrier Solutions
  - Cross Cut – Grid Integration
  - International Collaborations

State of the Wind Power Industry in the United States

Wind provides 6% of the nation's electricity and supports over 100,000 domestic jobs, including over 500 manufacturing facilities in 41 States



Wind-Related Manufacturing Facilities and Installed Capacity by State at end of 2016

The Southeastern U.S. has more than 100 manufacturing facilities supplying components and materials to the wind industry

Robust Industry

- Utility-scale wind power in 41 states and distributed wind power in all 50 states
- 14 states ≥10% wind generation, with four states >25% generation
- U.S. utilities operate high wind penetration without one-to-one backup or storage requirements today through balancing and forecasting management
- Wind power represented 30% of capacity additions in 2016
- 30 MW Block Island (RI) first offshore wind project began producing power in 2016

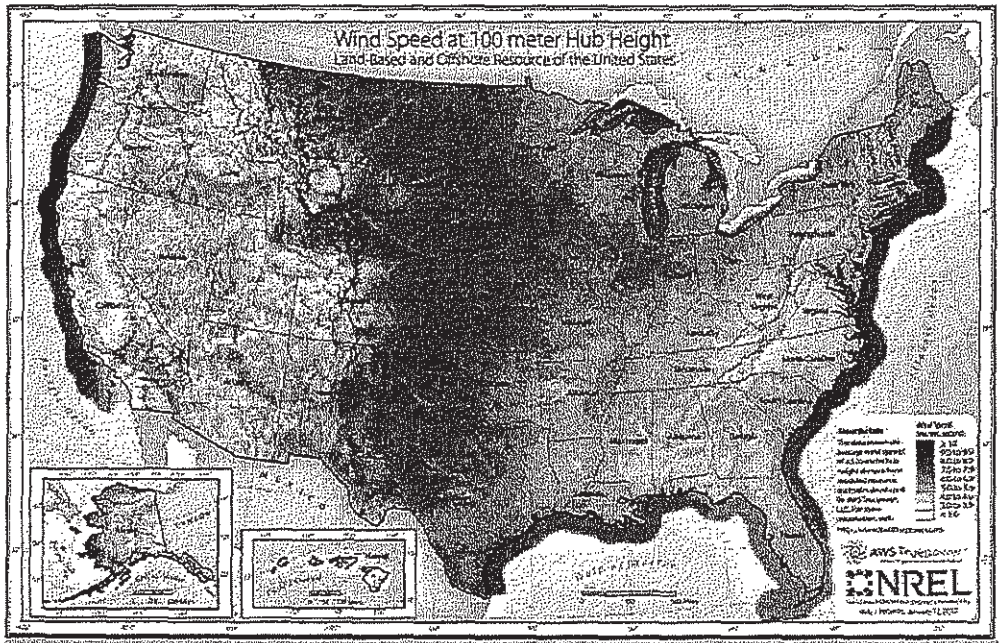
Domestically Sourced Components and Raw Materials

- 65-80% of towers, 50-70% of blades and hubs, and >90% of nacelle assembly for turbines installed in 2016 were manufactured in the U.S.
- Today's U.S. wind manufacturing capacity is 6-10 GW/year

We Can Do More Across All Regions

U.S. Wind Resources are Among the Best in the World

The combined land-based and offshore domestic, sustainable wind resource potential is more than 10 times greater than the total U.S. electricity demand



United States—Land-Based and Offshore Annual Average Wind Speed at 100 Meters above the ground

Untapped Wind Market Potential in All 50 States

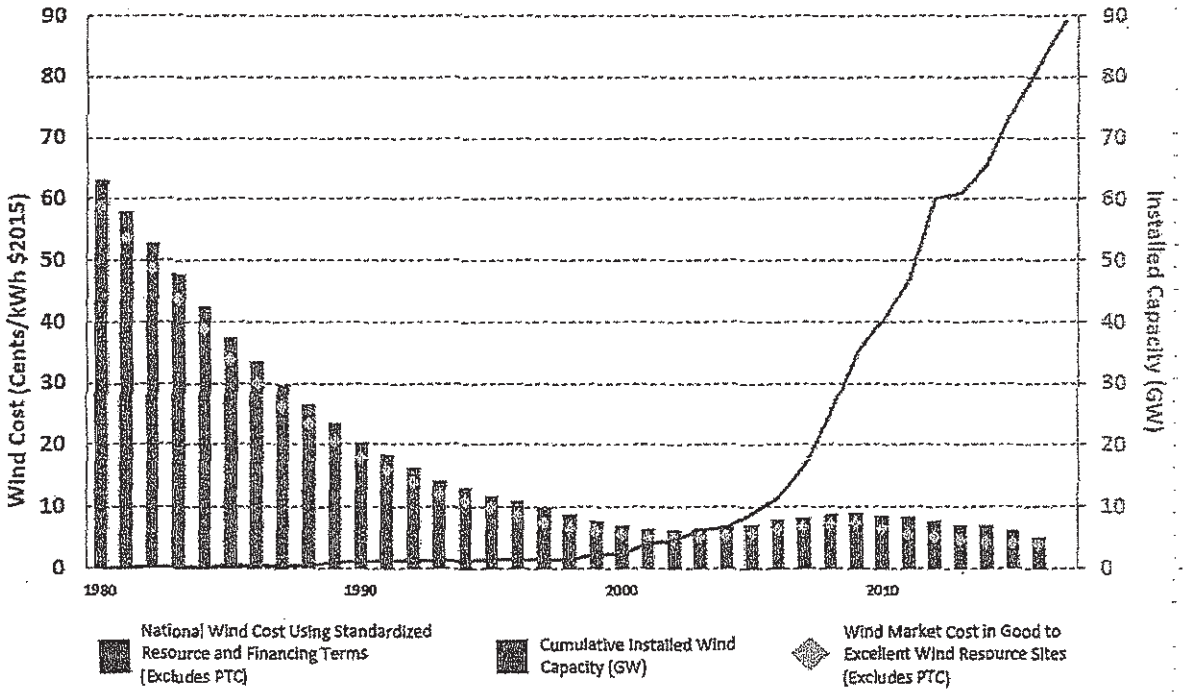
- Land-based utility-scale wind
- Offshore wind (OSW)
- Land-based distributed-scale wind

Barriers

- Wind turbine design
- Reliability
- Wind plant optimization
- Cost reduction
- Grid integration
- Mitigation of environmental impacts and human use impacts such as radar interference.

R&D has Contributed to Significant U.S. Wind Industry Innovation and Cost Reduction

National laboratories and federal wind test centers have enabled cost-effective development and validation of high-risk innovative wind technologies for over four decades



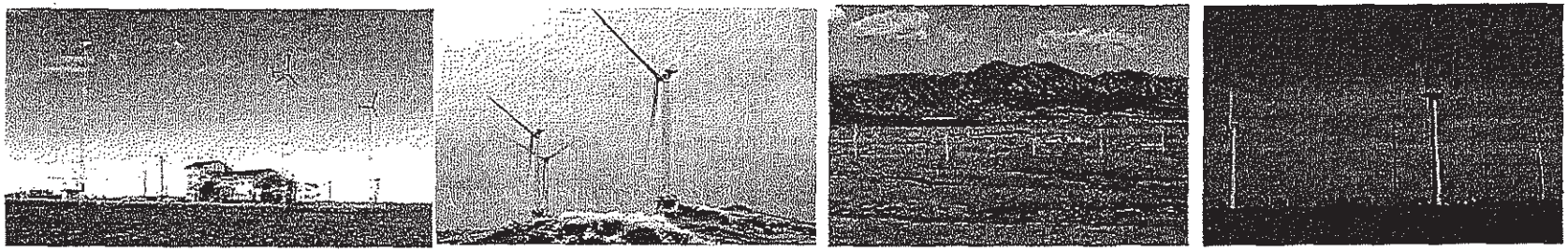
U.S. Wind Cost and Cumulative Deployment. The unsubsidized cost of wind energy in good to excellent wind sites dropped 90% from 1980 to 2016 – driven by DOE research and innovation. Industry has deployed a cumulative 89 GW as of 2017 year-end.

Sample DOE R&D Innovations

- **More than 154 DOE-funded wind patents** from 1978 through 2017, with an **additional 21 wind energy patents pending**
- **Advanced computer code development** and validation have accelerated technology innovation
- Airfoil and blade designs, including **aeroelastic tailoring, flatback airfoils, and carbon fiber design,** have enabled larger rotors with increased energy capture
- Development and demonstration of **MW class machines** and low wind speed turbines enabled cost-competitive utility-scale

FY 18 Multi-Year Program Plan

- Single integrated strategic document focused on land-based wind, offshore wind, and distributed wind
- Resources include:
    - Wind Vision (2015) and Wind Vision Roadmap Update (2017)
    - Enabling Wind Power Nationwide (2015)
    - National Offshore Wind Strategy (2016)
    - Enabling the SMART Wind Power Plant of the Future Through Science-Based Innovation (2017)
- 5-year plan with annual updates used for internal planning and budgeting
- Articulates DOE's unique program strategy to stakeholders (Congress, wind industry, national labs)
- Linked to administration strategies & guidance



DOE's Strategy to Capture more Wind Energy

Tall Wind: Taller Towers & Bigger Blades

- Big Adaptive Rotor initiative to develop low-specific power rotors (larger swept area) for tall wind applications, with an improvement in energy capture of up to 15 percent.
- By increasing hub height from 80 meters to 140 meters, the area in the U.S. that has a minimum net capacity factor of 30% is increased by 68%

Wind Plant Optimization

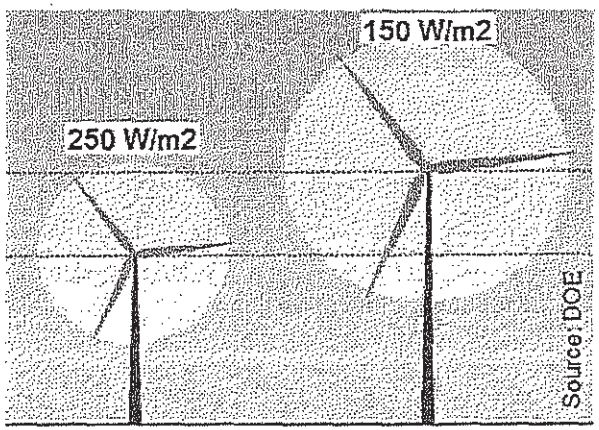
- R&D for next-generation wind plants to increase performance by reducing turbine-turbine wake interaction (current 20-30 percent energy reduction)
- Component and control innovations to reduce unsubsidized cost of wind energy by up to 50 percent by 2030.

Offshore Wind

- Collection and dissemination of wind and wave conditions data at U.S. offshore wind development sites.
- R&D to decrease technology costs and adapt to the unique U.S. conditions.
- Demonstration projects leveraging technologies that address U.S.-specific challenges.
- Evaluation of supply chain limitations.

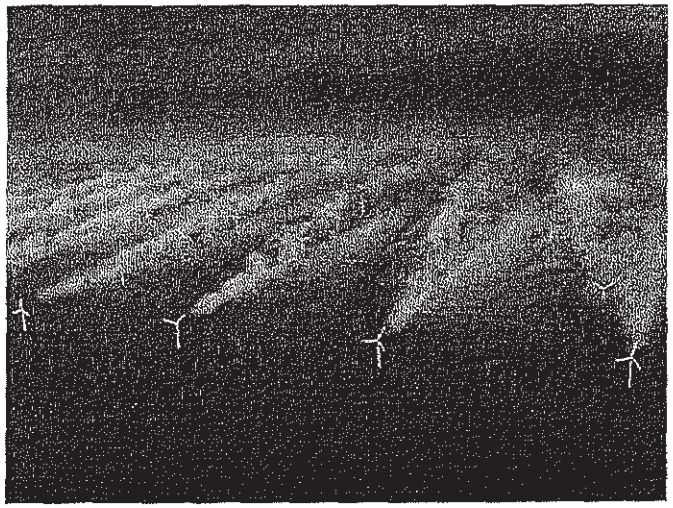
Distributed Wind Opportunities

- Integrated into microgrids



Current turbine size with contemporary rotor

Future turbine with larger size advanced technology rotor



Wake Interaction at Horns Rev Offshore Wind Farm

Program at a Glance| *DOE Actions*

Land-based Utility Scale Wind Offshore Wind Distributed Wind

Strategic Themes	Action Areas	DOE Current/Planned Activities
Reducing Technology Costs & Risks	1. Improved Wind Resource Forecasting 2. Understanding Wind Plant Flow Physics 3. Systems-level Wind Plant Design Tools 4. Improved Wind Plant Reliability 5. Next Generation Technology	• **Atmosphere to Electrons (A2e)** — Wind Forecast Improvement Project — High-Fidelity Wind Plant Aerodynamics — Integrated Systems Design and Analysis • Drivetrain Reliability Collaborative • Blade Reliability Collaborative • Big Adaptive Rotor (BAR) • Offshore Wind R&D Consortium
Mitigating Market Barriers	6. Addressing Regulatory Barriers, Environmental Performance, & Human Use Concerns 7. Wind Electricity Delivery & Grid Integration 8. Ensuring Robust Domestic Workforce	• Technical solutions to mitigate Wind/Wildlife Impact • Wind/Radar Interference Mitigation Research and Interagency Working Group • WindExchange and Information Dissemination • Research and technology development to address utility-scale and distributed wind (DW) grid integration, market design, and reliability services • Collegiate Wind Competition and Wind for Schools (DW)
Modeling and Analysis	9. Evaluation of Future R&D Investments 10. Quantifying/Communicating the Costs and Benefits of Utility-scale Wind	• Techno-economic Modeling and Analysis • Electricity Sector scenario analysis • Wind cost reduction analysis and reporting of the U.S. compared to global markets

Wind Energy Technologies Office Budget

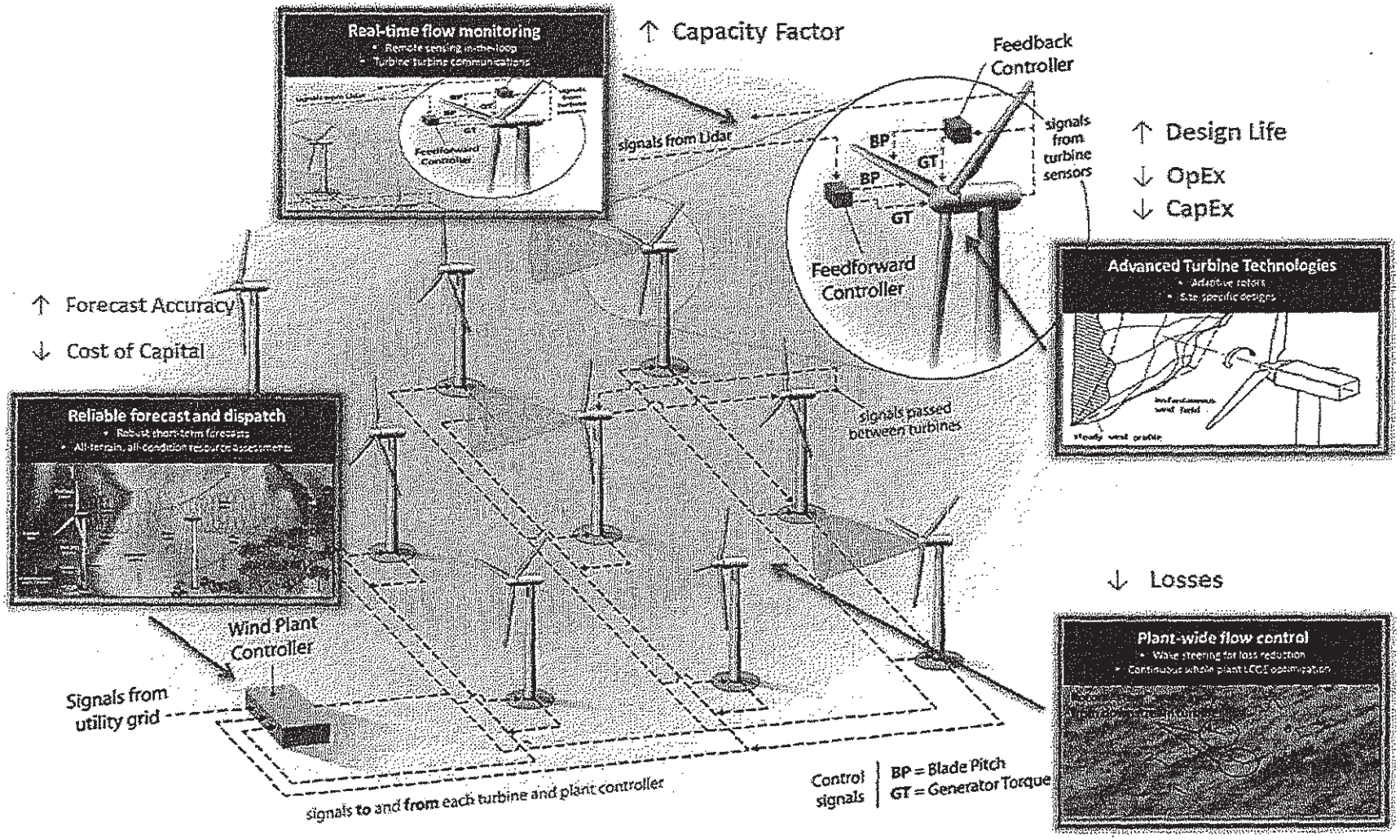
Wind Energy (Dollars in Thousands)	FY 2017 Enacted	FY 2018 Enacted	FY 2019 Request
Technology Research, Development & Testing and Resource Characterization (Land, Offshore, Distributed)	**28,346**	**64,000**	(b) (5)
Atmosphere to Electrons (A2e)	10,682	13,700	
National Lab Facilities	5,184	16,240	
Technology Innovation RD&T	12,480	34,060	
Offshore Wind Specific	*776*	*9,007*	
Distributed Wind Specific	*4,133*	*9,010*	
Technology Validation and Market Transformation	**40,000**	**0**	
Mitigate Market Barriers	**12,863**	**20,000**	
Grid Integration and System Reliability	5,452	6,900	
Wind/Radar Research and Testing	1,012	1,600	
Wind Turbine Environmental Performance and Siting	1,540	7,500	
Workforce Development and Stakeholder Engagement	4,859	4,000	
Modeling and Analysis	**8,791**	**8,000**	
Total	**90,000**	**92,000**	

Wind Energy – FY 2019 Request

- **Atmosphere to Electrons (A2e) ($11.5M):** A2e aims to improve the performance and reliability of next-generation wind plants by investigating systems-level interactions influenced by atmospheric conditions, variable terrain, and machine-to-machine wake interactions.
- **National Lab Facilities ($4.5M):** National Wind Technology Center (NWTC) and Scaled Wind Farm Technology (SWiFT) Facilities provide unique, state-of-the-art capabilities to U.S. industry and academia as a resource for research, development, testing and validation of their innovations.
- **Technology Innovation RD&T ($4M):** Focus is on fundamental research in the areas of controls, sensors, algorithms, materials, and manufacturing to lower costs and improve and operational performance. This includes addressing R&D challenges associated in the design and manufacturing of low-specific power rotors for tall wind applications.
- **Grid Integration and System Reliability ($3M):** As part of DOE's Grid Modernization Initiative (GMI) efforts, the program will focus on the tools and technologies to measure, analyze, predict, protect, and control the impacts of wind generation on the grid as it evolves with increasing amounts of wind power, and will continue to develop and refine the ability of wind turbines to provide Essential Reliability Services (ERS).
- **Beyond Batteries ($8M):** Focus on advances in controllable loads, hybrid systems incorporating generation from all sources, and new approaches to energy storage, which are essential to increasing the reliability and resiliency of our energy systems.
- **Wind/Radar Research and Testing ($0.5M):** Research, development and implementation of technology solutions, development of algorithms and tools, and definition of next-generation radar requirements to address wind/radar challenges. Key funded partnerships with DOD, DHS, DOT, DOI and DOC.
- **Wind Turbine Environmental Performance ($0.3M):** Evaluation of the environmental performance of existing wind farms and advanced, next-generation turbine concepts to inform the development of technical mitigation solutions.
- **Modeling and Analysis ($1.2M):** Efforts will focus on elaborating the potential impact of innovations in coupled offshore wind turbines and substructures, operations strategies, and A2e next-generation wind plant technologies.

Atmosphere to Electrons (A2e)

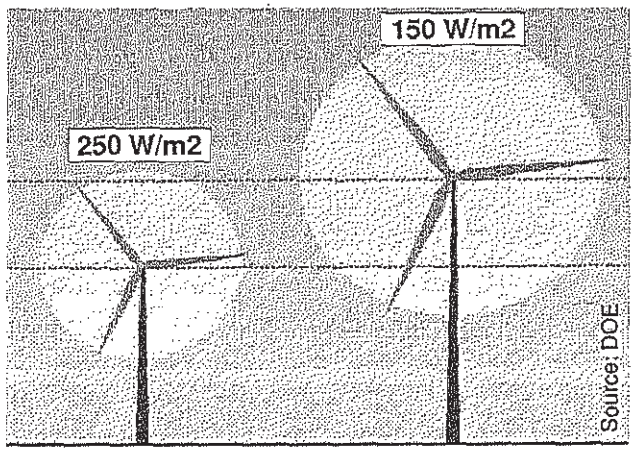
Wind Plant Design Improvements

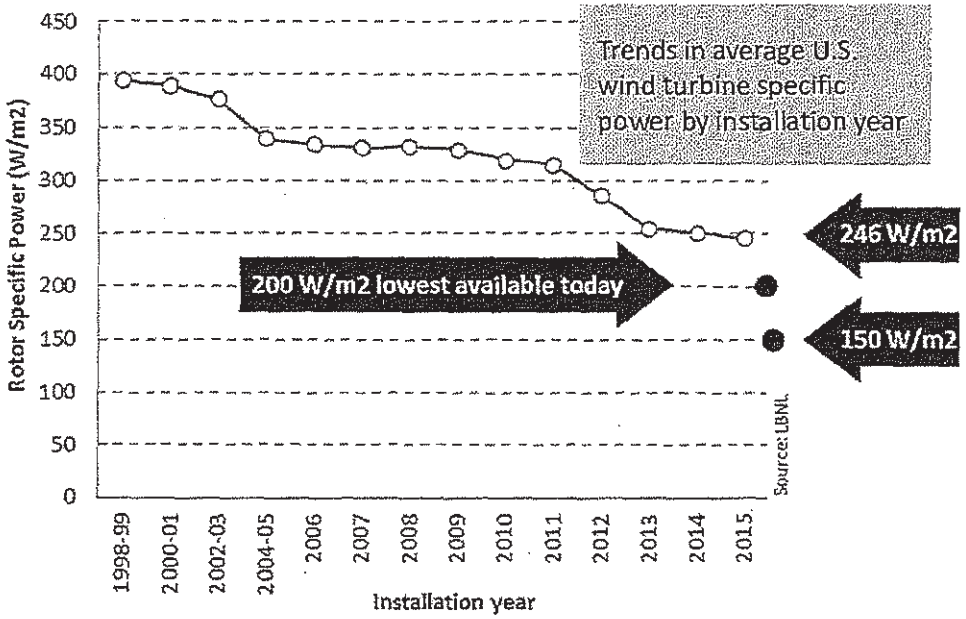


Big Adaptive Rotor Initiative

Technology Innovation and Testing

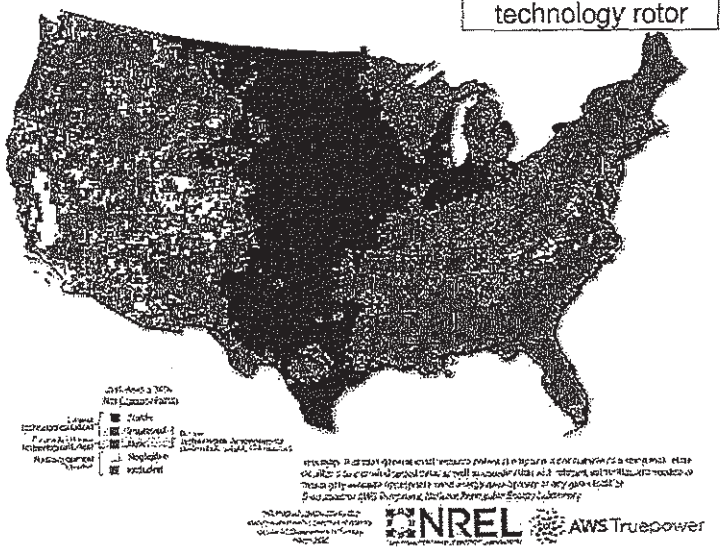
Advanced technology is required to design and manufacture very large <u>low specific power density rotors</u> that are lightweight, durable, and high-performing. In addition, transportation and other logistical challenges for tall wind applications must be addressed.





Current turbine size with contemporary rotor

Future turbine with larger size advanced technology rotor

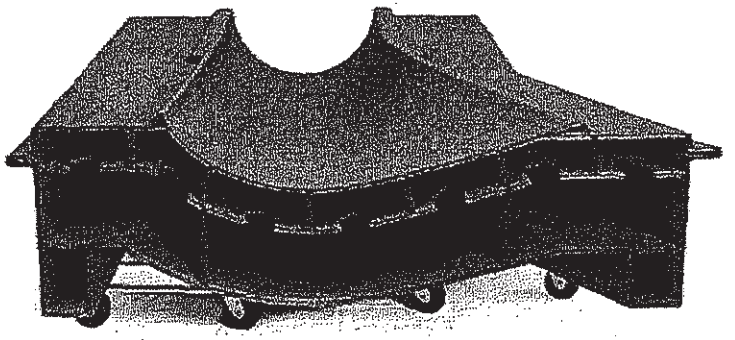


NREL AWS Truepower

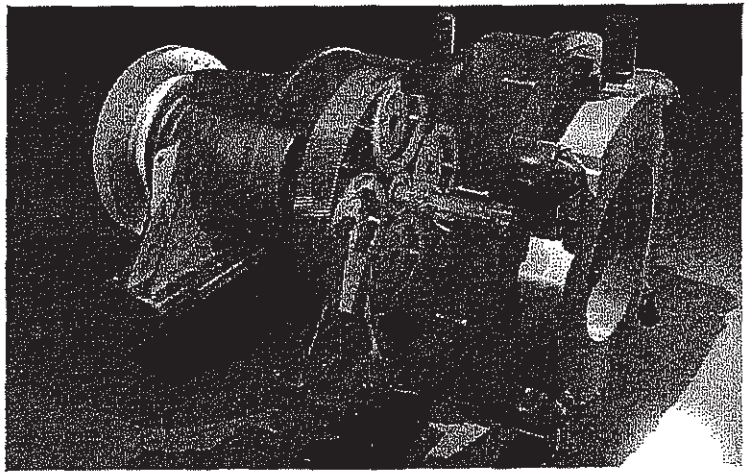
Technology Innovation RD&T

Continuous R&D and Collaboration

- Improving the wind turbine fleet reliability and **increasing U.S. manufacturing competitiveness through additive manufacturing**
- **Blade Reliability Collaborative** through understanding the effects of manufacturing defects and lightning damage on blade structures
- Wind turbine **Drivetrain Reliability Collaborative** to enable reductions in wind plant O&M costs
- Strengthening the body of knowledge necessary for reliable and cost-effective materials for use in additive, or **3-D, Manufacturing** that could remove limitations on tooling, configuration, component design and variations, or production time, lowering costs and transforming the wind manufacturing industry.



Additive, or 3-D, manufacturing has recently been used to manufacture wind rotor blade molds, offering significant time and cost savings. Blade sections produced from these molds are currently undergoing testing at the NWTC.



A World Leader in Wind Power

National Laboratory and Testing Facilities

DOE and its national laboratories play a crucial role in providing world class test facilities capability for validating component designs and performing valuable wind energy research

Blade Test Facilities

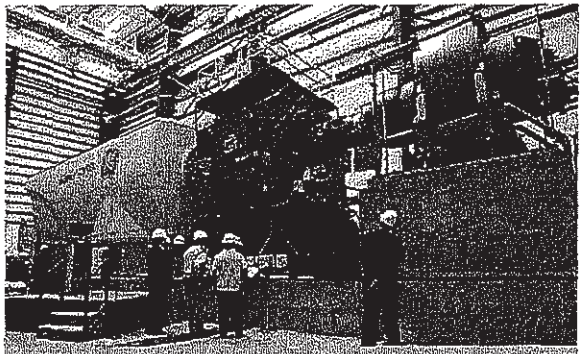
- National Wind Technology Center (NWTC) – 19m and 50m test stands

Drivetrain Test Facility and Grid Simulation

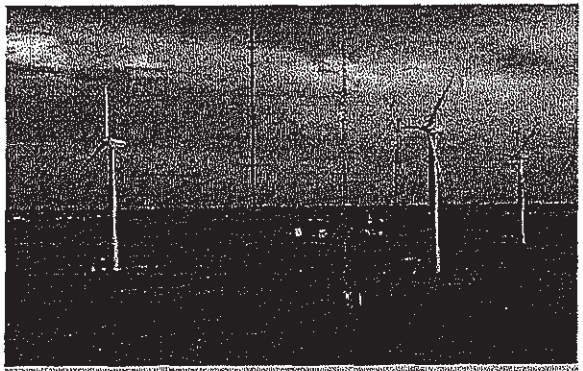
- National Wind Technology Center (NWTC) – 225 kW, 2.5MW and 5.0MW dynamometer drivetrain test facilities
- 7MVA Controllable Grid Interface

Plant Optimization Design and Test Capabilities

- Scaled Wind Turbine Test Facility (SWiFT) – turbine to turbine interaction research (Texas Tech University)
- National Wind Technology Center (NWTC) – controls research turbines and utility-scale research turbines
- DOE high-performance computing (HPC) capability for high fidelity wind turbine wake modeling and wind plant optimization.



NWTC provides field testing, drivetrain testing and grid simulation capabilities



Wind turbine to turbine interaction testing is a critical factor in evaluating the latest technological developments from A2e

National Offshore Wind Strategy

Offshore Wind Represents a Significant Opportunity for the Nation

- Technically accessible resource with ample space available for lease
  - ❖ 2,058 GW – double the current installed energy generation capacity in the U.S.
- Electricity demand growth and power plant retirements create a significant market opportunity for new generation
- Potential to achieve competitive cost

Key Challenges Remain

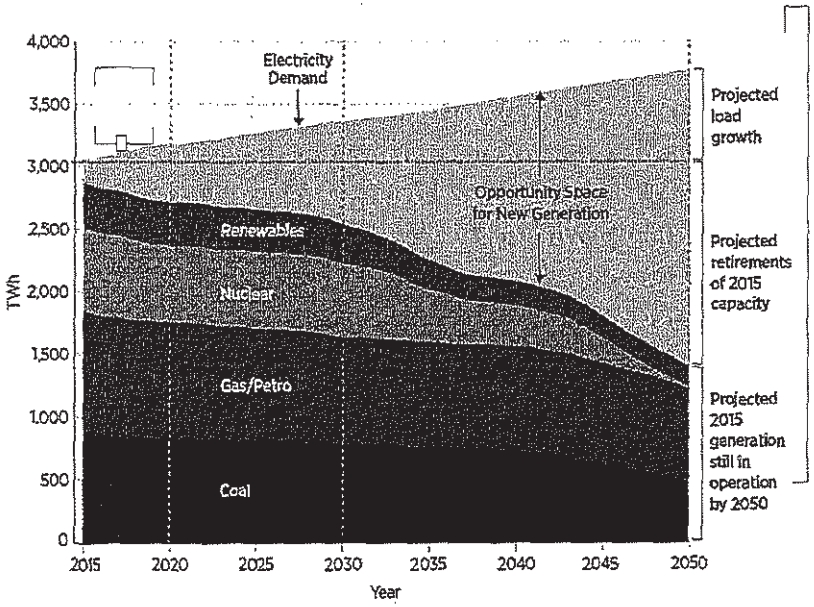
- Reducing technology and installation costs and risks
- Ensuring efficient, effective regulatory construct
- Supporting effective stewardship of the environment and public space
- Improving understanding of offshore wind's benefits

Robust and Credible Plan for Federal Action

- Over 30 DOE and DOI initiatives to address seven action areas and three strategic themes

Market Opportunity for Offshore Wind Generation

Utilizing announced and projected retirements, and projected demand, the opportunity space for offshore wind is ~2,400 TWh/yr by 2050, while total U.S. offshore wind potential is ~7,200 TWh/yr



Scheduled and age-based retirements and load growth create opportunity for new offshore wind generation in coastal regions.

Note: the opportunity space for the year 2015 represents energy currently imported to coastal states from non-coastal states.

DOE's Current Offshore Wind Funding

Offshore Wind R&D Consortium

- FY 17 funds - $18.5M (+$2M to DOE labs) funding opportunity now open to establish an R&D consortium with matching industry funds to accelerate U.S. offshore wind by supporting fundamental R&D addressing:
  - **Offshore Wind Plant Technology Advancement** -- floating foundations R&D, innovations in components, controls, and electrical subsystems.
  - **Resource and Site Characterization** -- validation of innovative methodologies to collecting *in situ* data, improve understanding of extreme conditions such as hurricanes.
  - **Installation, O&M and Supply Chain Technology Solutions** -- reduction of onsite O&M needs, reduction in costs through improved foundation technology and installation processes.

R&D Consortium Key Dates	
FOA Published	Dec. 12, 2017
Concept Papers Due	Jan. 23, 2018
Full Applications Due	Mar. 26, 2018
Expected Selection Notification	June 2018

Offshore Wind Advanced Technology Demonstration Projects

- Continue projects facilitating a competitive U.S. industry through the research and development of innovative technologies with the potential to lower the cost of energy.

Offshore Wind Plant Optimization

- Improve the performance and reliability of next-generation optimized plants by investigating systems-level efficiency losses influenced by atmospheric conditions and turbine-turbine wake interaction in large arrays.

Offshore Wind Market Acceleration and Deployment by Supporting Early-Stage R&D

- Develop new technologies for monitoring wind-wildlife interactions in the offshore wind space, and information aggregation and dissemination through domestic and international collaborative partnerships.

Offshore Wind Resource Science (FOA)

This FOA is a joint U.S. Department of Energy (DOE) and National Oceanic and Atmospheric Administration (NOAA) initiative to improve offshore wind resource characterization and forecasting

- **Issues Addressed**
  - Offshore atmospheric flow conditions are unique and different from land-based forms.
  - Available marine wind-profile measurements indicate that vertical extrapolation of near-surface wind data can lead to large errors in estimating winds at hub height.
  - Numerical weather prediction models, often used to provide wind information in inaccessible locations, have not yet been extensively validated over the ocean.
  - Lack of reliable wind information at the heights of turbine rotors over the ocean translates into increased uncertainty and risk, and ultimately increases the capital costs of offshore wind projects.
- **Impacts**
  - Significantly increased capability and confidence for predicting the wind resource offshore, including associated turbulence.
  - Better representation of waves and resultant structural loading for offshore turbines.
  - Higher confidence in assessing risk to offshore wind plants associated with extreme atmospheric events.

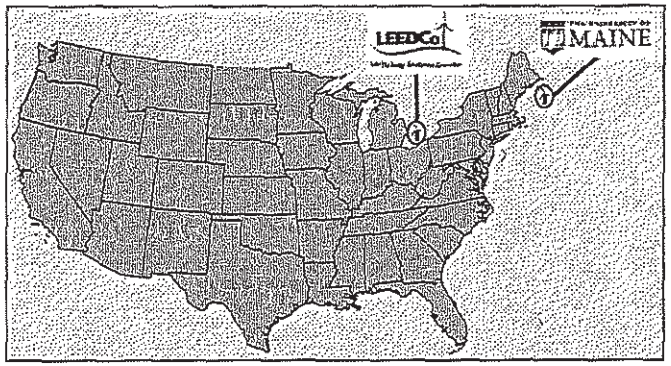
Offshore Wind Advanced Technology Demonstration Projects
Brief History

DOE seeks to demonstrate offshore wind innovations at multi-megawatt scale to reduce the cost of energy and address regional challenges and opportunities, expediting development of the US offshore wind industry

2013 - Seven Projects
- Regionally and technologically diverse
- Goal: 50% Front End Engineering Design (FEED) including vendor quotes
- Down-Select based on progress and technical viability

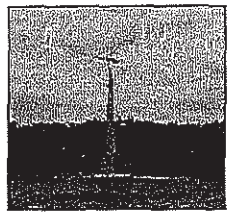
2014 – Five Projects (three projects, two alternates)
- Goal: 100% FEED, vendor quotes, installation and O&M, completion of NEPA, regulatory and interconnection requirements
- Go/No-Go based on progress to accomplishing goals, including power purchase agreement

2017 – Two Projects
- Goal: Fabrication, installation and commissioning of the project by 2020; environmental and performance data collection 5-years beyond project completion
- Regular Go/No-Go decision points

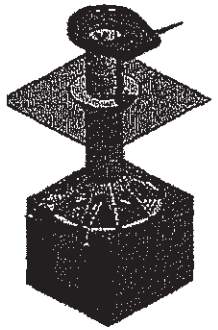


Current Portfolio

University of Maine
- Monhegan, ME
- 12 MW project, 2 turbines
- Floating concrete semi-submersible to handle deepwater offshore wind resources



LEEDCo
- Cleveland, OH
- 20.7 MW project, 6 turbines
- Monobucket (monopile large suction pile) to resist weak soils surface ice conditions of the Great Lakes



Distributed Wind | *Major Untapped Potential in Rural America*

Significant Market Potential

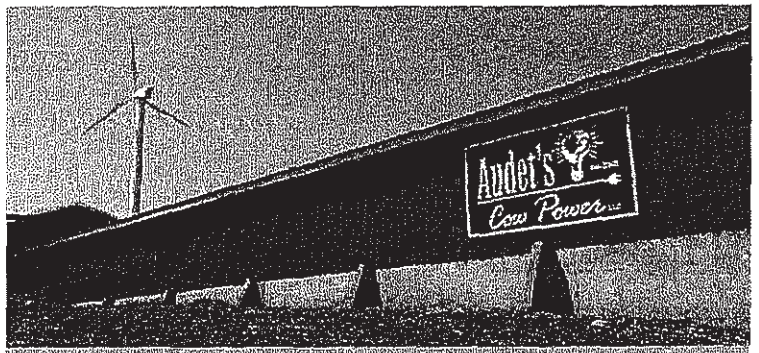
- Technically feasible for approximately 49.5 million residential, commercial, and industrial sites nationwide.
- Market potential of nearly 4 GW by 2030 and 20 GW by 2050.
- Presently **over 75,000 wind turbines**, totaling 934 MW in cumulative capacity, deployed **across all 50 states.**

Made in America

- U.S. small wind (≤ 100kW) turbine manufacturers report domestic content levels ranging from 66% to 100%.
- U.S. distributed wind businesses support **jobs in 23 states.**
- U.S. small wind turbine manufacturers accounted for **nearly 98% of domestic sales** in 2016.

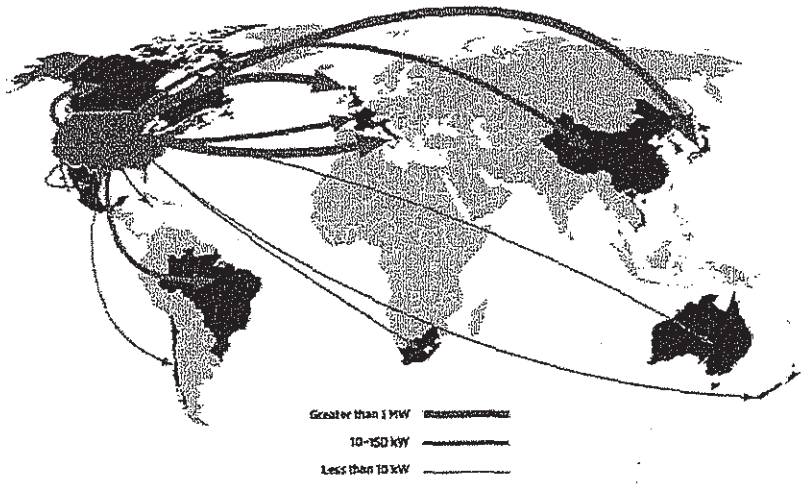
Global Leadership

- U.S. manufacturers accounted for nearly **75% of 2015 global small wind turbine sales.**
- U.S. small wind manufacturers doubled exports to international markets from 2014 to 2015.
- Since 2011 exports have accounted for more than half of U.S. small wind manufacturers sales.



Distributed wind is used to provide power to remote "off-grid" communities and to offset all or a portion of energy costs for retail power customers.

US Small Wind Exports, 2015



Wind Energy Future: Distributed Wind

Competitiveness Improvement Project (CIP)

Increased Energy Production

CIP *system optimization* awardee Bergey Windpower of Norman, OK, achieved a 110% energy production increase for the Excel 15 turbine over the Excel 10 turbine by increasing blade length, improving blade aerodynamics and system controls

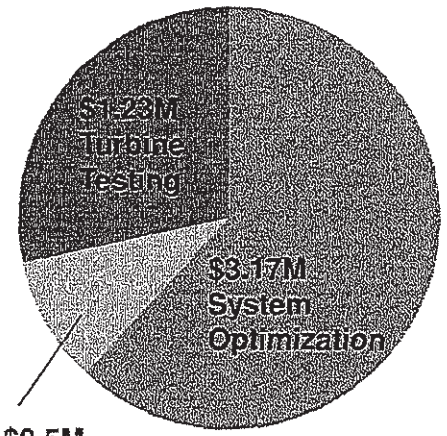
Reduced Hardware Costs

CIP *advanced manufacturing* awardee Pika Energy of Westbrook, Maine, reduced blade costs by approximately 90% by developing an innovative tooling and cooling strategy to produce blades using injection-molded plastic.

Certified Turbine Performance & Safety

CIP *turbine testing* awardee Primus Windpower of Lakewood, Colorado, achieved turbine certification—third-party verified testing for safety, function, performance, and durability—to international standards. Three CIP awardees are currently conducting certification testing.

As of April 2018, DOE and NREL have awarded 21 subcontracts to 11 companies, totaling $4.9 million of investment across 3 research areas



$0.5M
Advanced Manufacturing

Bergey Windpower (Norman, OK)

Endurance Wind Power (Seattle, WA)

Intergrid (Temple, NH)

Northern Power Systems (Barre, VT)

Pika Energy (Westbrook, ME)

Primus Windpower (Lakewood, CO)

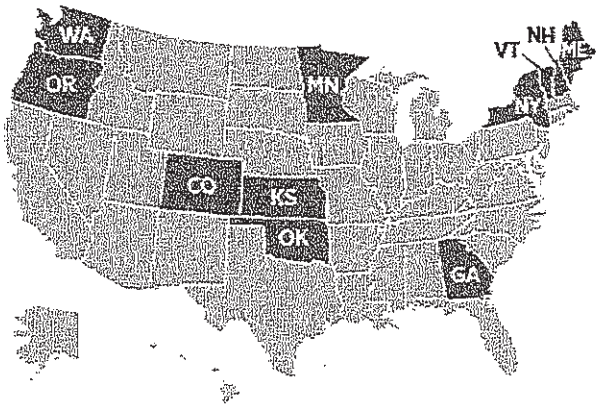
Sonsight (Lawrenceville, GA)

Urban Green Energy (New York City, NY)

Ventera Wind (Duluth, MN)

Wetzel Engineering (Lawrence, KS)

Xzeres (Portland, OR)

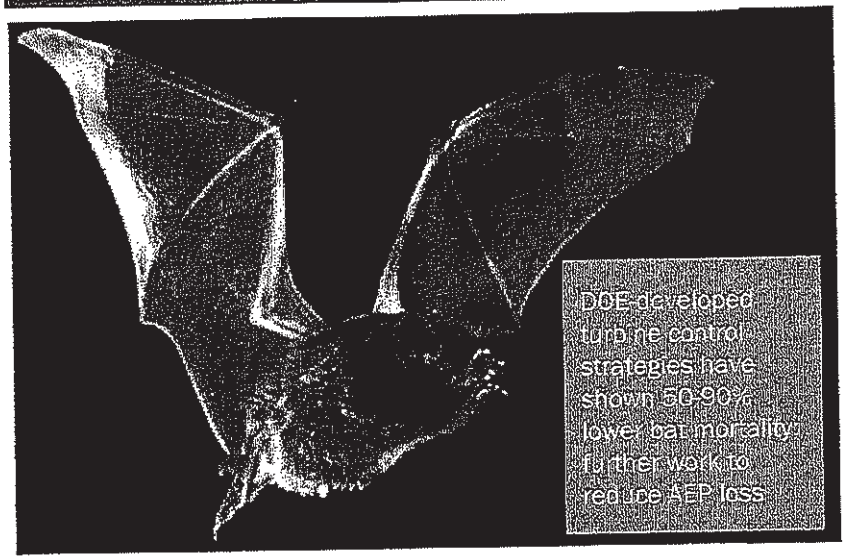


Market Barrier Reduction

Environmental Performance & Radar

Develop and validate technology solutions to reduce regulatory restrictions associated with wind wildlife impacts and radar interference, and ensure next-generation wind energy and radar technologies are designed to overcome these challenges

Environmental Performance



- Detection, deterrence, controls strategies, and other mitigation technologies to reduce impacts to protected birds, bats and marine species
- Integrate environmental performance as key design consideration in next-generation wind technologies

Radar Interference Mitigation

Strong interagency collaboration and cost-sharing under MOU

- Improve capabilities to evaluate impacts of wind energy on sensitive radars
- Upgrades to legacy radars to increase resistance to wind turbine interference
- Integrate wind turbine interference mitigation in next-generation radars

Advanced Components and Wind Farm Operational R&D to Reduce Cost, Minimize Regulatory Barriers, and Improve Environmental Performance (FOA)

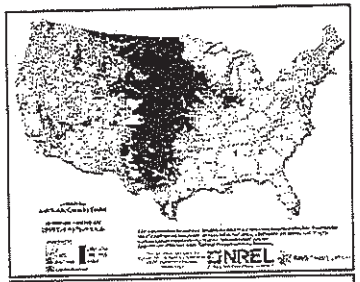
Land-Based Wind

- **Advancing Smart Curtailment Strategies**
  - Smart curtailment refines periods when turbines are shut down. This methodology could help unlock low wind speed sites in the east and mid-west.
  - Deterrent technologies offer a potential solution to eliminate energy loss through curtailment.
  - Goal: Develop operational regimes and advanced algorithms that minimize the energy loss due to curtailment regimes currently required.
- **Advanced Component Research and Development**
  - Investments in technologies such as ultrasonic acoustic deterrents have led to advancements in prototype technology options, however these technologies remain early stage and there are key technical challenges remaining.
  - Goal: Support the development of novel instrumentation/components as a replacement for curtailment.

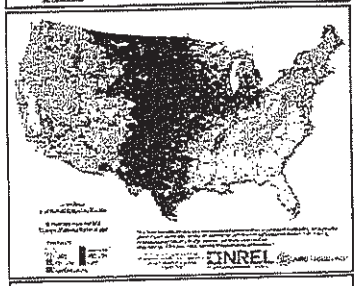
Offshore Wind

- **Development and Validation of Offshore Wind Monitoring and Mitigation Technologies**
  - Absence of technology to monitor and minimize impacts from wind to offshore wildlife has led to delays and uncertainty in permitting processes for the first US offshore wind projects including DOE demonstration projects. Noise effects may also affect construction windows.
  - Goal: Support development and validation of monitoring and impact minimization technologies to minimize permitting delays and construction window limits.

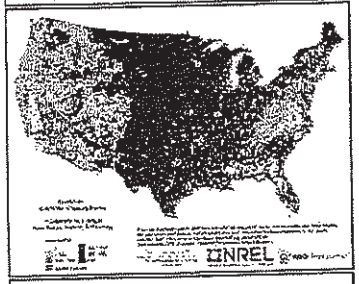
80M 2008 Tech



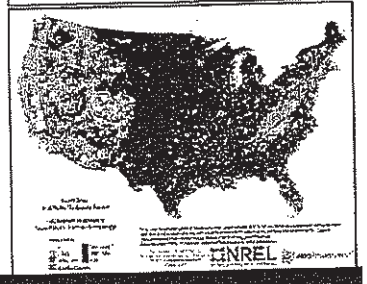
80M Current Tech



110M Near Future



140M Near Future

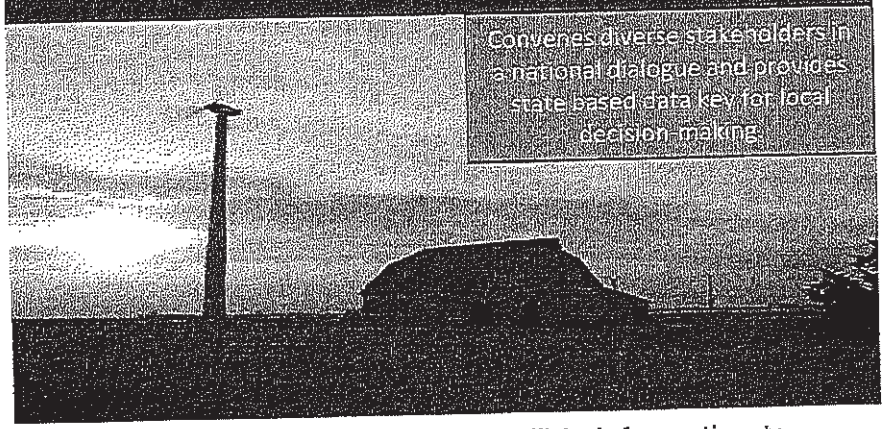


Market Barrier Reduction

Human Use Conflicts, STEM Education & Workforce Development

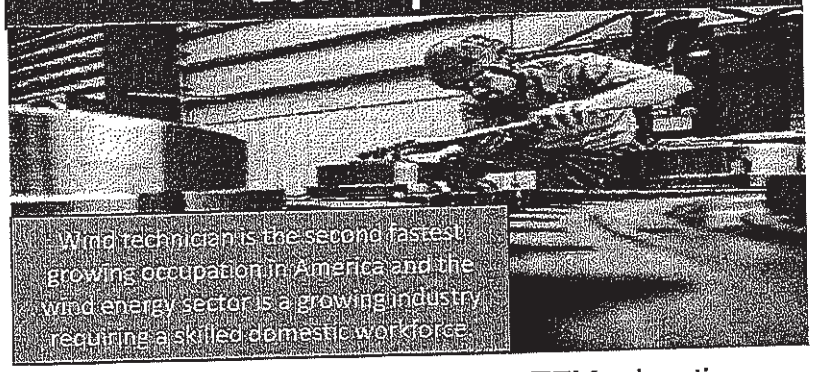
To provide the best available science to enable well-informed wind energy deployment decisions, reduce regulatory barriers surrounding human use conflicts, and to ensure the availability of a robust domestic workforce

Human Use Conflicts



- Information dissemination of credible information to inform wind energy decision making, such as state based resources including state specific wind resource assessment maps, provides information for commercial land-based, distributed, and offshore wind.
- A National Public Acceptance Baseline Study provided the first quantitative assessment of the factors associated with public acceptance of wind energy development to inform future technology development e.g. noise mitigation

STEM Education & Workforce Development



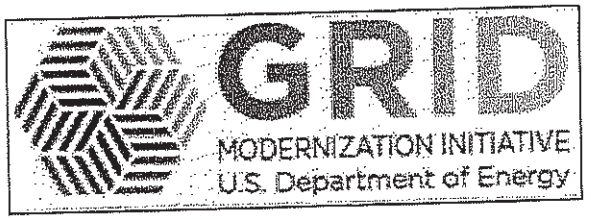
- Supporting the development of STEM education through activities like the Wind for Schools program integrating small wind turbine installations at rural U.S. elementary & secondary schools designed to power their schools and to complement curriculum and K-12 STEM activities.
- Workforce preparation to catalyze the wind workforce of the future, through activities such as the Collegiate Wind Competition, providing real-world experience to challenge college students to develop solutions to complex wind energy challenges.

Grid Integration

- **Coordinated with the DOE Grid Modernization Initiative**
  - The program leverages resources across EERE and DOE's Office of Electricity to address challenges common to multiple generation and grid technologies. Additionally, the program focuses on several issues more directly germane to wind energy.
- **Providing Essential Reliability Services**
  - Changes in the national generation mix require that variable generation sources work to improve their ability to provide the suite of reliability services that had historically been provided by conventional generation sources.
  - This is accomplished by testing these capabilities and working with industry to refine how the capabilities are further developed to meet the needs of the ever-changing power grid. These efforts will need to be further coordinated with A2e efforts to enable the wind plant of the future.
- **Market Design**
  - As the generation mix changes, so too must the process by which generators are compensated for providing energy , capacity and reliability services.
  - This is accomplished by developing models of electricity markets and evaluating how rule changes impact overall compensation, sharing the results and iterating on how rules can be adjusted to maximize market efficiency for all generation sources.
- **Infrastructure Investment and Utilization**
  - The long-lived nature of transmission infrastructure requires careful upfront analysis to ensure that any new lines will be best utilized. New technologies, such as dynamic transmission line rating (DLR), can allow increased utilization of existing infrastructure.
  - This is accomplished by conducting integration studies to evaluate various transmission build-out scenarios which are informed by ever-changing technology improvements; and supporting the development of DLR technologies.

Beyond Batteries

- As part of the DOE Grid Modernization Initiative, Beyond Batteries builds on successful GMI projects with an enhanced focus on technologies that combine generation and load to increase grid reliability, resiliency, and flexibility.
- Beyond Batteries will focus on advances in controllable loads, hybrid systems incorporating generation from all sources, and new approaches to energy storage, which are essential to increasing the reliability and resiliency of our energy systems.
- In FY19, the program will fund ($8M) projects centered on the evaluation and enhancement of essential reliability services from wind power plants, the evaluation of conceptual transmission plans to optimize the delivery of wind energy, hybrid integration of wind energy with other EERE technologies (such as hydrogen production), and integration studies to further understand the impact of ever increasing amounts of wind energy on power grid operations.



Beyond LCOE

Through the EERE Grid modernization Laboratory Consortium (GMLC), The Wind Energy Program will work with strategic stakeholders to confirm the usefulness of new and enhanced existing metrics that will guide grid modernization efforts to maintain and improve:

- Reliability, Resilience, Flexibility,
- Sustainability, Affordability, and Security

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

The effort will go beyond estimation of capital and variable costs (LCOE) to estimate the full costs and benefits of installed technology:

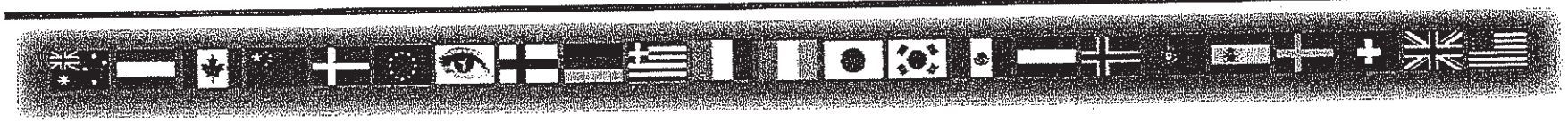
Costs: • Capital • Variable • Externalities

Benefits: • Determine beneficiary • Time dependent benefit • Location-specific benefit

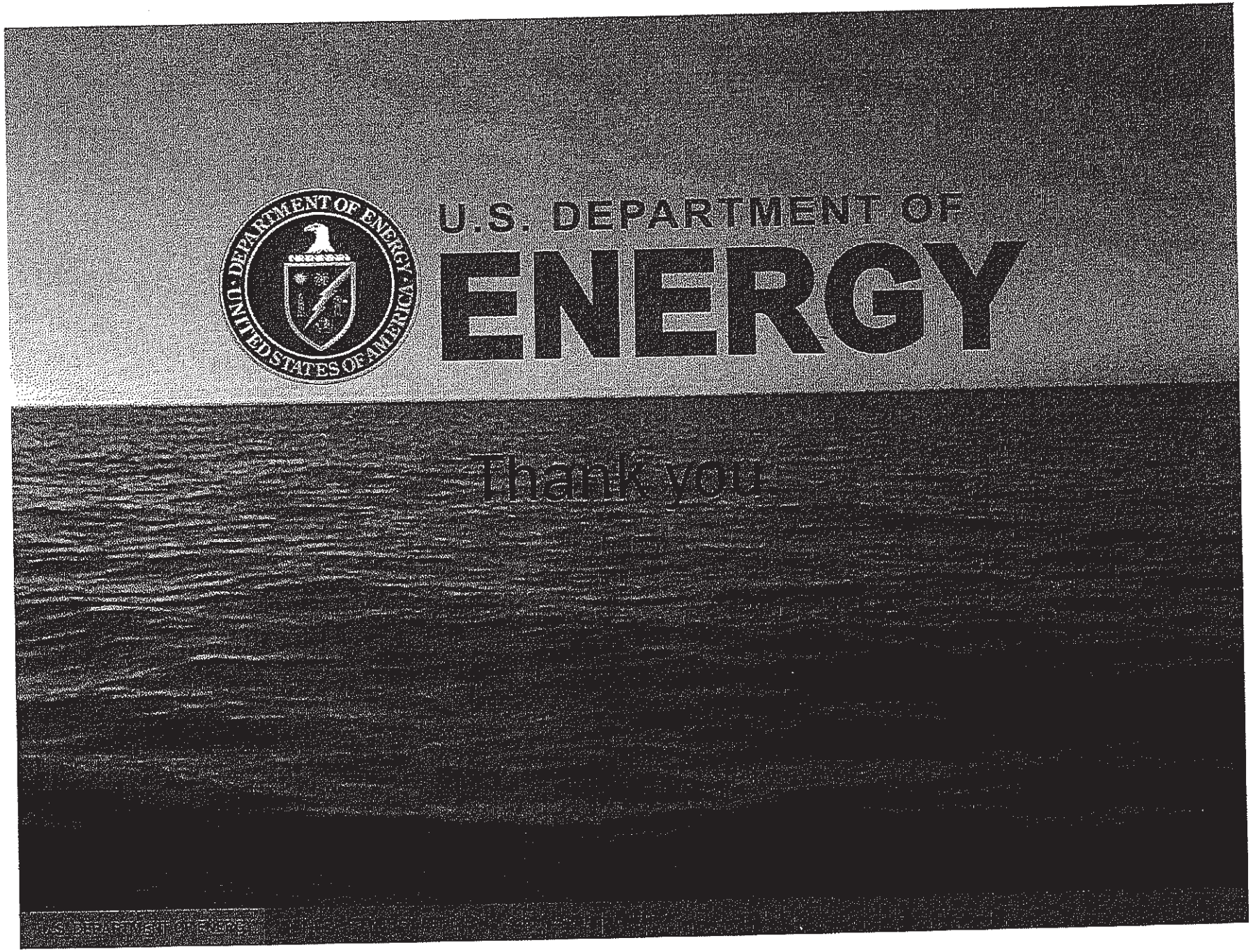
"A failure to properly reflect in market prices the value of reliability to consumers and operator actions taken to ensure reliability can lead to inefficient prices in the energy and ancillary services markets leading to inefficient system utilization, and muted investment signals."

-FERC Staff Analysis of Shortage Pricing in RTO and ISO Markets

International Collaboration



- **International Energy Agency - collaborative wind energy R&D addressing:**
  - Wind Characteristics
  - Wind Power Technology
  - Wind Integration
  - Social, Educational, and Environmental
- **National Lab partnerships**
  - Danish Technical University
  - Netherlands Energy Research Center
  - Fraunhofer Institute for Wind Energy Systems


U.S. DEPARTMENT OF
ENERGY
thank you

Background

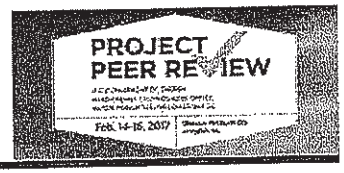
Wind Energy – FY 2018 Priorities

- **Atmosphere to Electrons (A2e):** Funding for the Wind Forecasting Improvement Project (WFIP II), mesoscale-microscale coupling, high-fidelity modeling (HPC), rotor wake measurements and predictions for validation, advanced flow control science for wind plants, integrated systems design and analysis, the A2e data archive and portal (DAP), and integrated planning and portfolio analysis.
- **National Lab Facilities:** Significant investment to increase capabilities at the National Wind Technology Center (NWTC) and encourage external use, along with continued maintenance and operations.
- **Technology Innovation Research, Development and Testing (RD&T):**
  - **Advanced components, reliability, and manufacturing:** Increase in funding for advanced components, reliability, and manufacturing efforts to prioritize early-stage research on materials and manufacturing methods and advanced components that will enable accessing high-quality wind resources, and on development that will enable these technologies to compete in the marketplace without the need for subsidies. Includes full funding for the Big Adaptive Rotor (BAR) program and plans for a collaborative initiative with AMO to improve thermoplastics composites and 3-D printing.
  - **Distributed Wind:** Significant increase in funding per congressional direction, including continuation of the competitiveness improvement project (CIP) and additional efforts focused on LCOE reduction, domestic manufacturing, and lowering market barriers for distributed wind systems, including small wind for rural homes and farms. Includes the new American Microgrid Project (AMP)
  - **Offshore Wind:** Plan to issue a competitive solicitation to develop a comprehensive multi-seasonal data set that will allow the validation of wind/wave resource models for offshore wind. Activities that will accelerate fundamental offshore-specific research and development, such as those that target technology and deployment challenges unique to U.S. waters, and funding for offshore wind buoy science and deployment.

Wind Energy – FY 2018 Priorities (con,t)

- **Grid Integration and System Reliability:** Continued development of electricity market models for ensuring that wholesale market design adequately compensate all participants for service provided and increased funding for advancements in grid capabilities at the NWTC.
- **Wind/Radar Research and Testing:** Continued evaluation of existing technologies that mitigate the interference of wind turbines on air traffic and military radars. Technologies include radar processing algorithms, Radar Cross Section reducing technologies, to data fusion.
- **Wind Turbine Environmental Performance:** Plan to issue a competitive solicitation to develop technical solutions including advanced components and wind farm operational research to reduce cost, minimize regulatory barriers, and improve environmental performance. The effort aims to help wind energy compete in the marketplace without the need for subsidies, and address offshore wind energy deployment challenges unique to U.S. waters.
- **Workforce Development and Stakeholder Engagement:** Continued funding for Wind Exchange, Wind for Schools, and the Collegiate Wind Competition.
- **Modeling and Analysis:** Activities to inform the DOE offshore wind research agenda and assess impacts and value propositions of future offshore wind R&D areas of focus. Includes funding for "Beyond LCOE" effort to improve and standardize programmatic metrics for renewable power impacts on the grid and support for scenario analysis and tool development to inform prioritization of future early-stage R&D efforts.

Peer Review (2014 – 2016)



- **61 Projects Reviewed**
  - Representing 80% of the WETO Project Funding
    - Resource Characterization
    - Technology Research, Development, and Testing
    - Market Acceleration and Development
- **Average Program Score "Outstanding to Good**
  - R&D Portfolio and Management/Operations
  - Rated "Average to Good: Communications & Outreach
- **Average Project Quantitative Scores**
  - RC and Tech RD&T: Relevance: 4.4 | Performance: 4.0
  - MA&D: Relevance: 4.5 | Performance: 4.3

Numerical scores correspond with a rating of 1 to a "Poor" rating, 2 to "Fair," 3 to "Average, 4 to "Good," to 5 indicating "Outstanding

Program Score Categories:

- Program objectives
- R&D portfolio Management/Operations
- Communications and Outreach

Project Evaluation on Relevance and Performance

- Relevance refers to the overall perceived value of a project
- Performance standards included: methods, accomplishments, management, collaboration, and future research.

WETO Partnerships



Interagency Activities

- FERC, DOE Office of Electricity Delivery and Energy – transmission planning, policy, and permitting
- NOAA – wind forecasting and meteorology
- MOU between BOEM and EERE for the coordinated deployment of offshore wind
- DoD, DHS, FAA – integrated field test and evaluation of radar systems
- Fish and Wildlife Service – coordination on wind siting guidelines and issues

Federal Energy Regulatory Commission

NOAA

BOEM
Bureau of Ocean Energy Management

DOE's Role in Addressing U.S. Offshore Wind Challenges

Conduct R&D to Improve U.S. Competitiveness	Enhance U.S. Energy Security and Independence	Strengthen Domestic Manufacturing and Economic Growth

- **Help achieve significant cost of energy reductions** through R&D, to optimize wind plant performance, develop advanced components, improve reliability, and resource characterization data
- **Address market barriers through early stage research** that reduces risk
- **Optimize grid integration and transmission** for wind systems through integration studies and operational forecasting tool development
- **Convene stakeholders and partners:** National Offshore Wind Strategy, roundtables, workshops, open door for industry
- **Disseminate data and results:** reports, websites, conference participation, journal papers, etc.

U.S. Offshore Wind R&D Consortium

FOA *Framework*

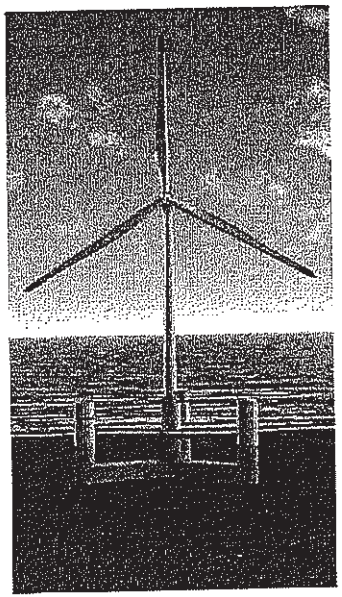
U.S. Offshore Wind R&D Consortium ($20.5M)	
Background	While knowledge can be leveraged from the European offshore wind experience, the unique challenges in the U.S. may lead to innovative solutions not seen in the European market. The creation of a cooperative, public-private Offshore Wind Consortium will maximize the impact of DOE's research and development funding while addressing the needs of the nascent U.S. offshore wind industry. Industry consortium members would drive the priorities of the consortium, resulting in targeted collaborative research in which Universities, National Labs, researchers, and other commercial entities could participate. In alignment with the findings of extensive offshore wind industry outreach and engagement from the *2016 National Offshore Wind Strategy*, this consortium would aim to reduce costs and technology risks through three specific pillars of research and demonstration: Offshore Wind Plant Technology Advancement; Offshore Wind Power Resource and Physical Site Characterization; and, Installation, Operations and Maintenance, and Supply Chain Technology Solutions.
Proposal	DOE is seeking an organization to function as consortium administrator that can: 1. Serve as a primary point of contact for the consortium, with full accountability to the DOE; 2. Provide strong leadership and establish a robust business model to leverage expertise and external funding; 3. Administer competitive solicitations to address the research agenda set by the consortium members; and 4. Attract key industry players as members.
Consortium Goals	1. Creating a world-leading innovation hub that brings together private and public entities to co-invest in the research, development and validation of innovative offshore wind technologies; 2. Attracting a membership body that can develop a research agenda which will include a diverse portfolio of projects addressing both near and long-term technology research that is needed to lower the cost of offshore wind energy in the U.S.; 3. Maximizing public funds by establishing an industry matching structure; and 4. Participation in research projects by world-class researchers, including National Labs, universities, private-industry, not-for-profits, etc., and leveraging any relevant existing private and public sector resources and facilities such as industry laboratories, national laboratories, university centers, and other government investments.
Funding Amount (Cost Share %)	$20.5M (50% CS) : $18.5M to Consortium Directly, $2M to National Labs
Funding Mechanism / Performer	FOA /Consortium Administrator Note: The consortium administrator will be evaluated on experience running consortia/joint industry projects, and offshore wind expertise, among other criteria. The FOA application will also be evaluated on the proposed consortium members, research initiatives, and engagement of universities, national labs, etc.
Time Period	4 years (fully funded in first year)

U.S. Offshore Wind R&D Consortium FOA
Why Choose a Consortium Model?

- **The time is now**
  - While there is increased interest in the U.S. market, **specific challenges identified** in the *National Offshore Wind Strategy* require industry wide collaboration:
    - **Challenge: Deep water** – ~60% of the US technical resource in water greater than 60m. Floating technologies still need significant fundamental research to reduce CAPEX, i.e. validation of engineering tools to structurally optimize floating foundations.
    - **Challenge: Hurricanes** – a significant portion of the Atlantic coast is susceptible to hurricanes, and hurricane models need to be created in order to predict turbine loading.
    - **Challenge: O&M Costs** – O&M is a significant cost driver for offshore wind, especially in the U.S. with a limited supply chain. Technology advancement in health monitoring, remote sensing, and other areas can reduce these costs.
- **Alignment with the R&D needs identified *2016 National Offshore Wind Strategy***
  - All action areas from the *Reducing Technology Costs & Risks* strategic theme are consortium research pillars.
- **Multiple funding rounds and accelerated learning**
  - Information sharing across research topic areas and industry adds to the knowledge base in an accelerated manner and allows for immediate solicitations of targeted and relevant research.
- **Commercial adoption of the technology is a natural outgrowth of consortium**
  - Consortium members are industry end users, who will use the research results and the technology developed in the consortium; therefore, demonstration and implementation of these technologies is a natural outgrowth of the consortium.
- **DOE Leadership**
  - DOE will lead research topic formation, merit review, interim progress reviews, and any needed course correction.

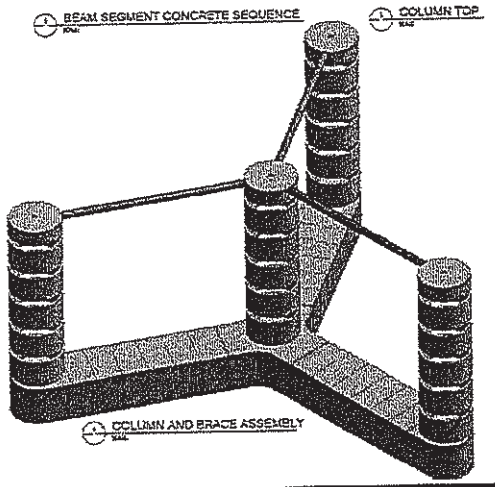
University of Maine: NE Aqua Ventus I
Project Overview and Updates

Substructure Type	Turbines	Location	Water Depth	Project Cost	Commission Date
Floating concrete semi-submersible	2 X 6MW GE Turbines	2.5 Miles offshore Monhegan Island, ME State Waters	90-120m	~$250M	2020



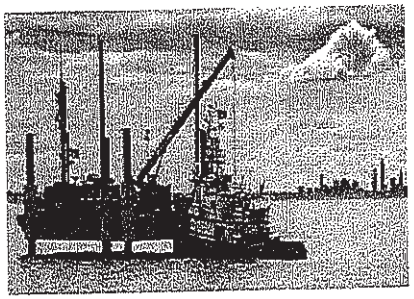
Project Highlights

- Unique floating concrete substructure that can be fabricated in Maine and can be utilized in deepwater nationwide.
- The UMaine-developed, patented VolturnUS floating concrete hull technology can support wind turbines in water depths of 45 meters or more.
- Turbine can be installed and commissioned in port and towed to the deployment site



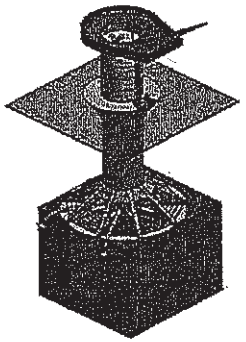
LEEDCo Icebreaker Wind Project
Project Overview and Updates

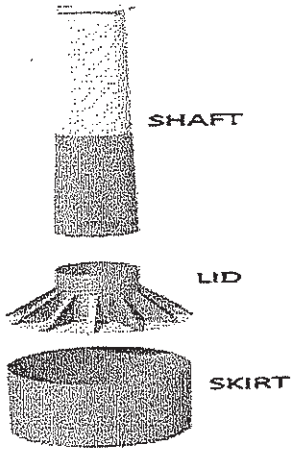
Substructure Type	Turbines	Location	Water Depth	Project Cost	Commission Date
Fixed-bottom Mono bucket	6 X 3.45MW Vestas Turbines	Lake Erie 7 miles offshore Cleveland, OH State Waters	~17m	~$210M	2020



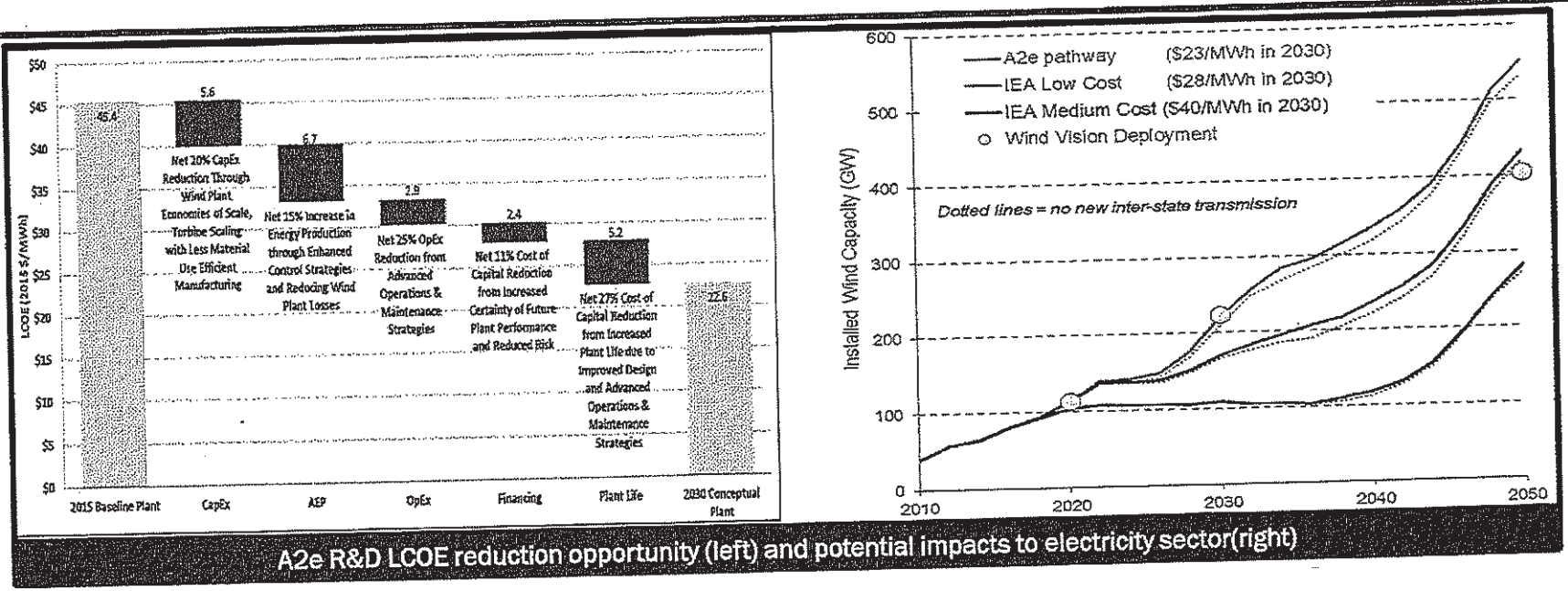
Project Highlights

- Mono bucket substructure
  - ❖ Innovative design uses technology utilized in the oil and gas industry
  - ❖ Technology can be installed without significant noise or seabed disturbance
- Icebreaking integrated into the substructure – critical for Great Lakes offshore wind
- Partnered with Fred Olsen Renewables as project partner/investor
- Draft NEPA Environmental Assessment completed





Analysis & Modeling



A2e R&D LCOE reduction opportunity (left) and potential impacts to electricity sector(right)

R&D Pathway Assessment

- Technical and economic analysis to find the most promising technical pathways for early-stage federal R&D investment to reduce cost, increase value to grid and overcome regulatory and other market barriers
- FY18 Highlight: Overcoming Large Blade Barriers: chart best technology path (through industry workshop and follow-on analysis exploring onsite manufacturing, advanced logistics, and hybrid solutions) to achieve ultra-large wind blades not currently deployable in US land-based market

Market and Strategic Scenario Analysis

- Provide insight into wind's costs and benefits in the electricity sector, and explore impacts of DOE R&D investment on grid, economy, and environment
- FY18 Highlight: "Beyond LCOE": collaborative work with RP programs and SPIA to understand RP technologies' full costs and value streams to the grid and enable more robust evaluation and comparison of energy options

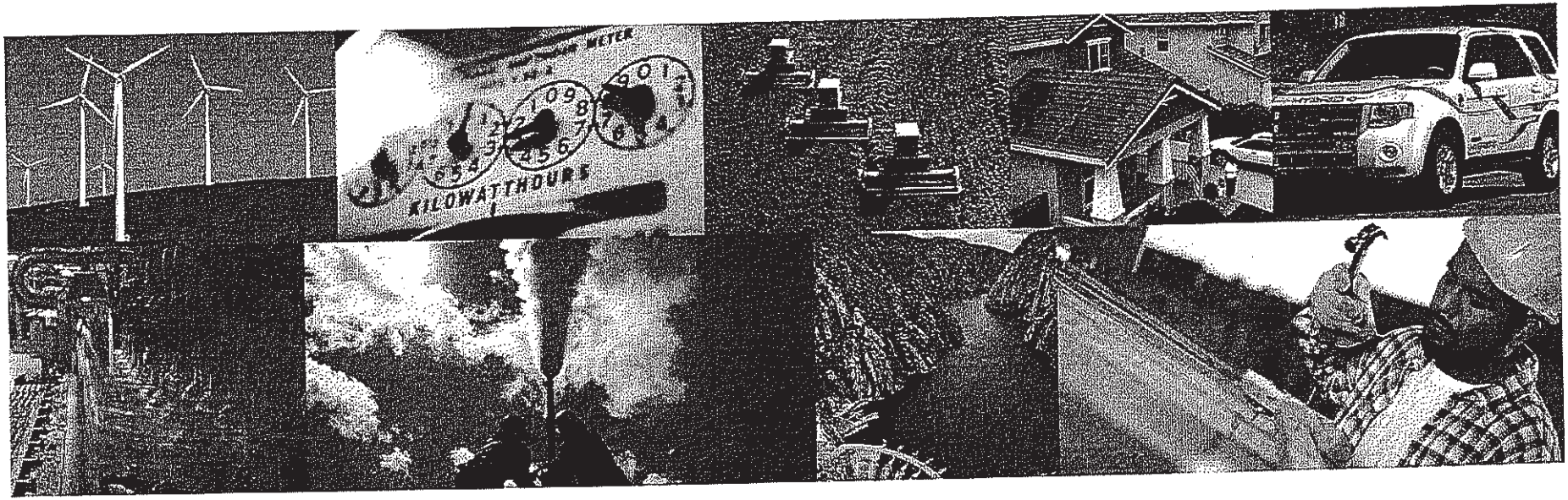
U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

Briefing for OMB

Alejandro Moreno, Director, Water Power Technologies Office

April 2018

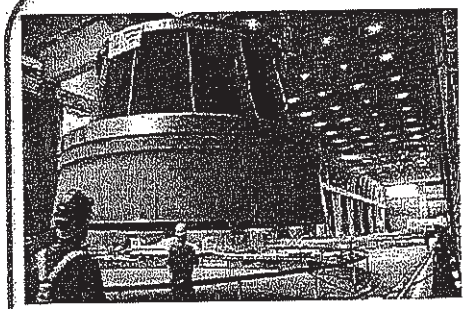


Basic outline per program

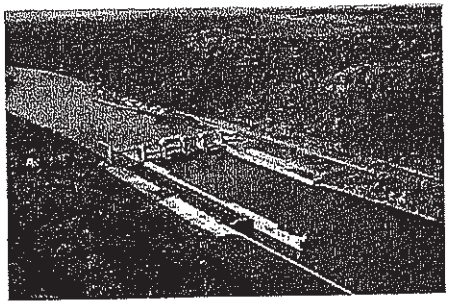
- Overview
- Program areas
- Budget
- Project examples (in backup)
  - Few projects per program
  - Including a slide towards the end of FY18 highlights

Water Power: Many Different Opportunities

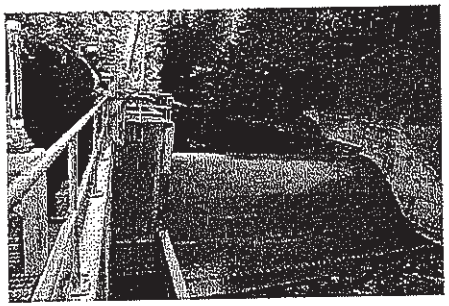
Covering first



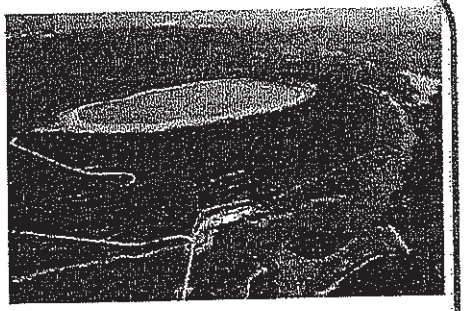
Upgrades for Existing Hydropower



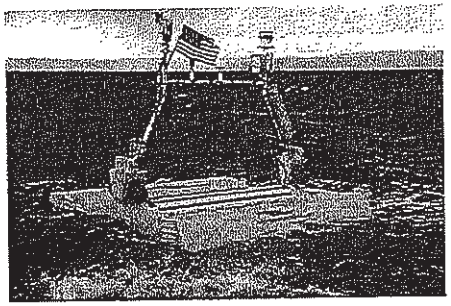
Non-Powered Dams and Conduits



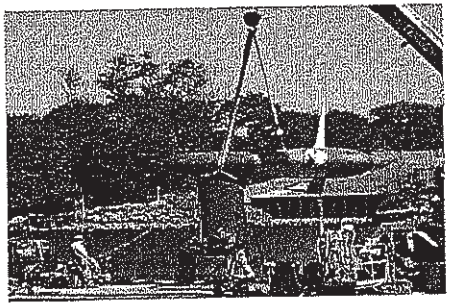
New Low-Impact Projects



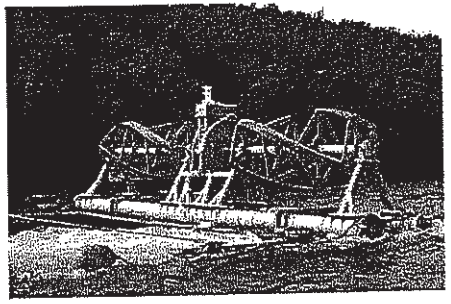
Pumped Storage



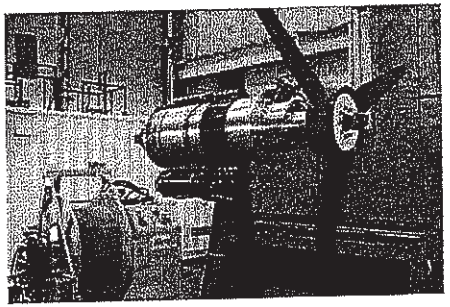
Wave



Tidal

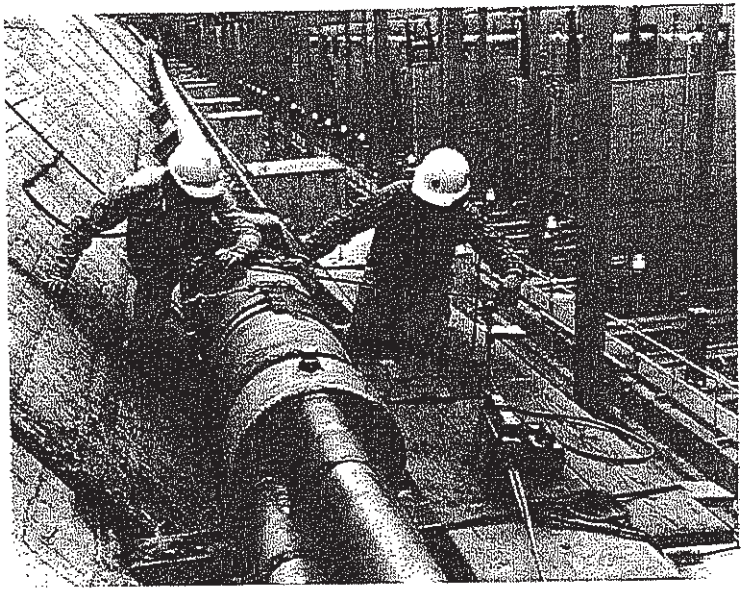


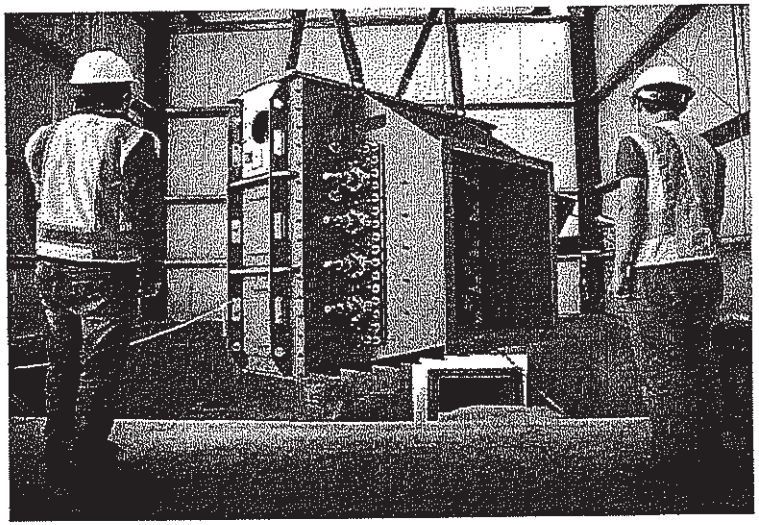
River Current



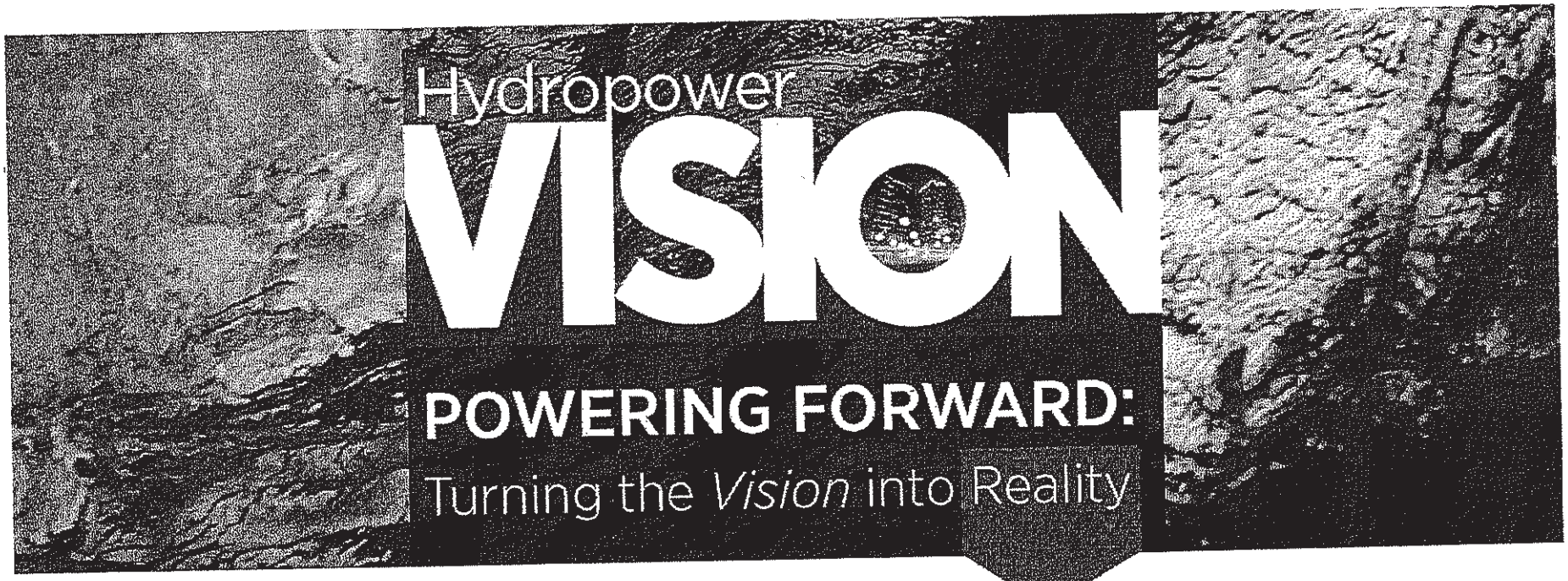
Ocean Currents

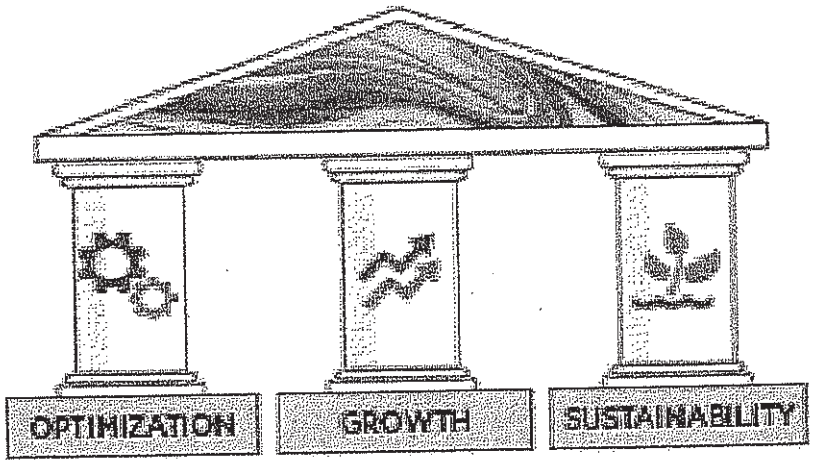
Overview of U.S. Hydropower





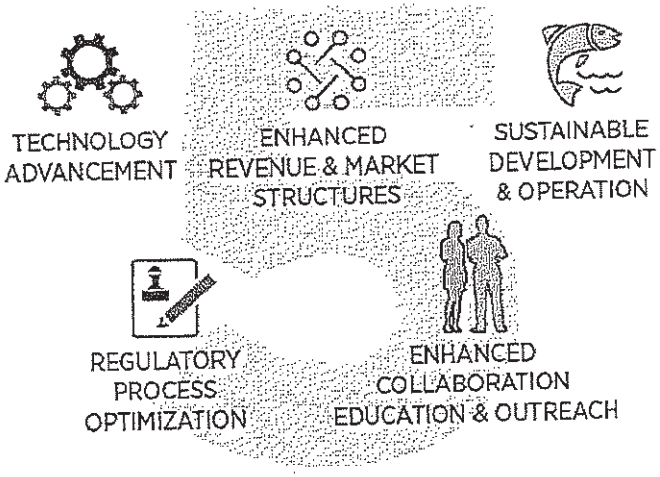
- Existing plants provide over 87,000 jobs across 49 states
- Strong U.S. manufacturing base with over 170 companies, spread across 35 states, producing hydropower components
- Optimizing the existing U.S. fleet, improving efficiency of facilities, and growing new capacity could produce benefits of $148 billion in investments and 78,000 more hydropower jobs by 2050





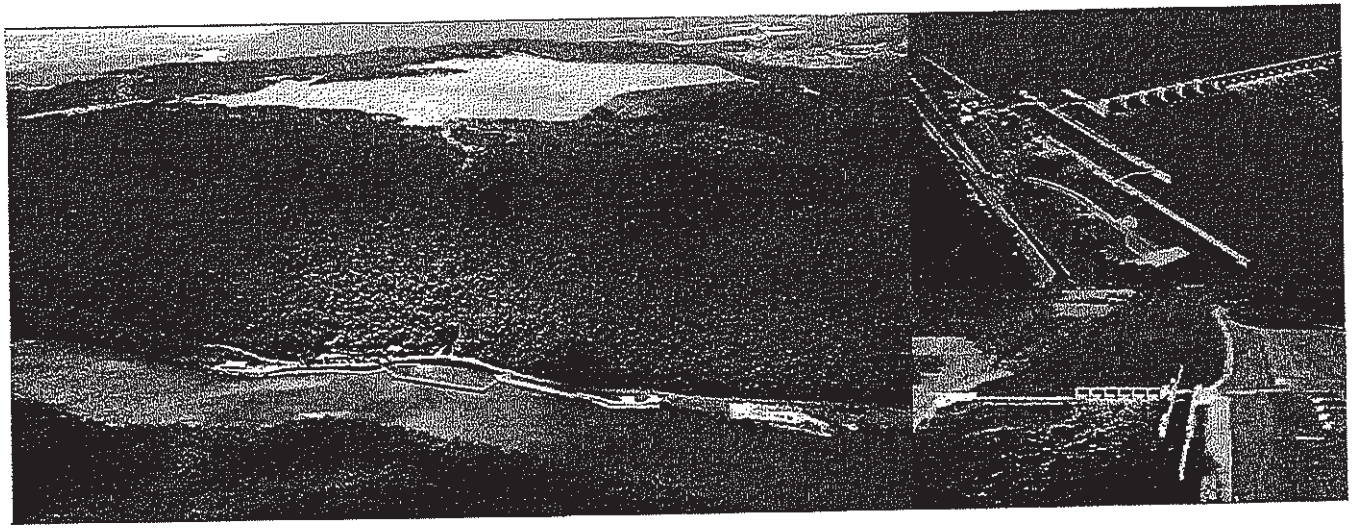
5 ACTION AREAS

64 detailed actions



WPTO Hydropower Program's Approaches

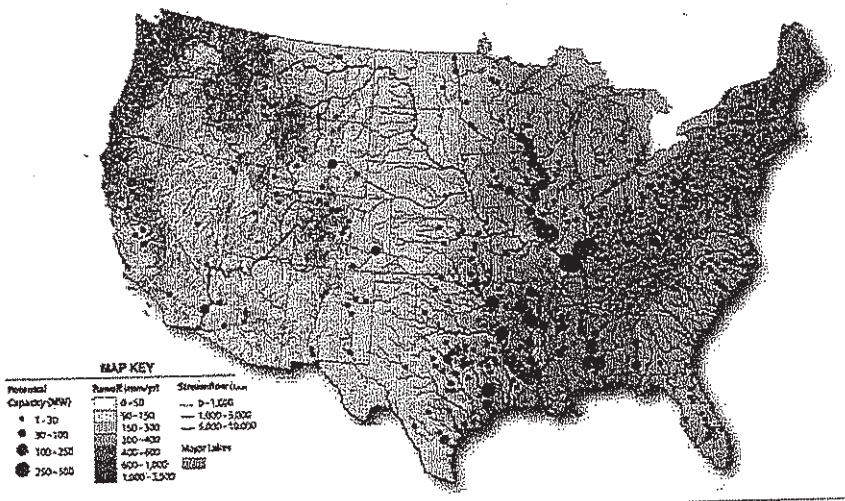
- **Technology R&D for Low-Impact Hydropower Growth (HydroNext)**: early-stage research in **technologies and systems** to reduce costs and unlock new resources
- **Grid Reliability and Resilience**: research to evaluate and improve the ability of hydro and pumped storage to provide **essential flexibility and reliability services** for the rapidly evolving electric grid
- **Environmental R&D and System Optimization**: research to **improve environmental performance and reduce regulatory delays** for existing and future hydropower technologies, and evaluate system-level risks & opportunities for hydropower and other water uses
- **Data Sharing and Analysis**: supply objective **data and analysis,** often based on information collected over the course of other WPTO research efforts, to decision makers and important hydropower industry stakeholders

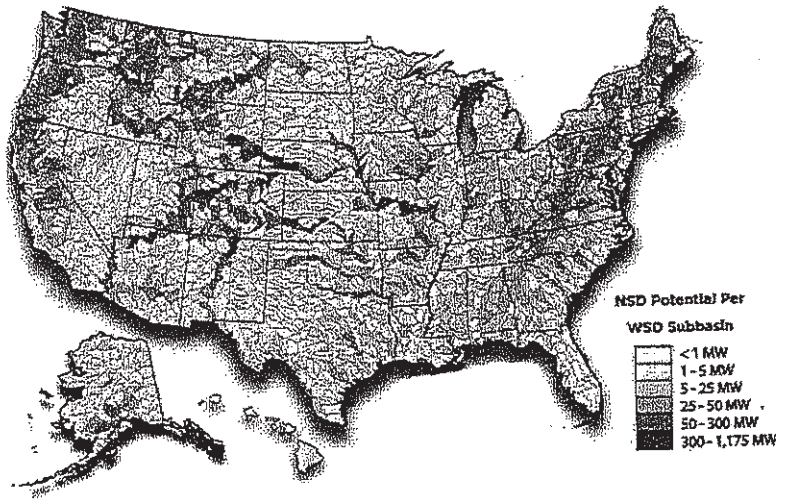


Growth: Reducing costs and unlocking new resources

Opportunity and challenges

- At least 25 GW of low-impact small hydropower resources yet to be developed at non-powered dams and in new streams
- Remaining resources require new technologies to reduce capital costs, standardize manufacture, and minimize environmental impacts
  - Lack of mechanisms / infrastructure to test and validate new technologies and designs

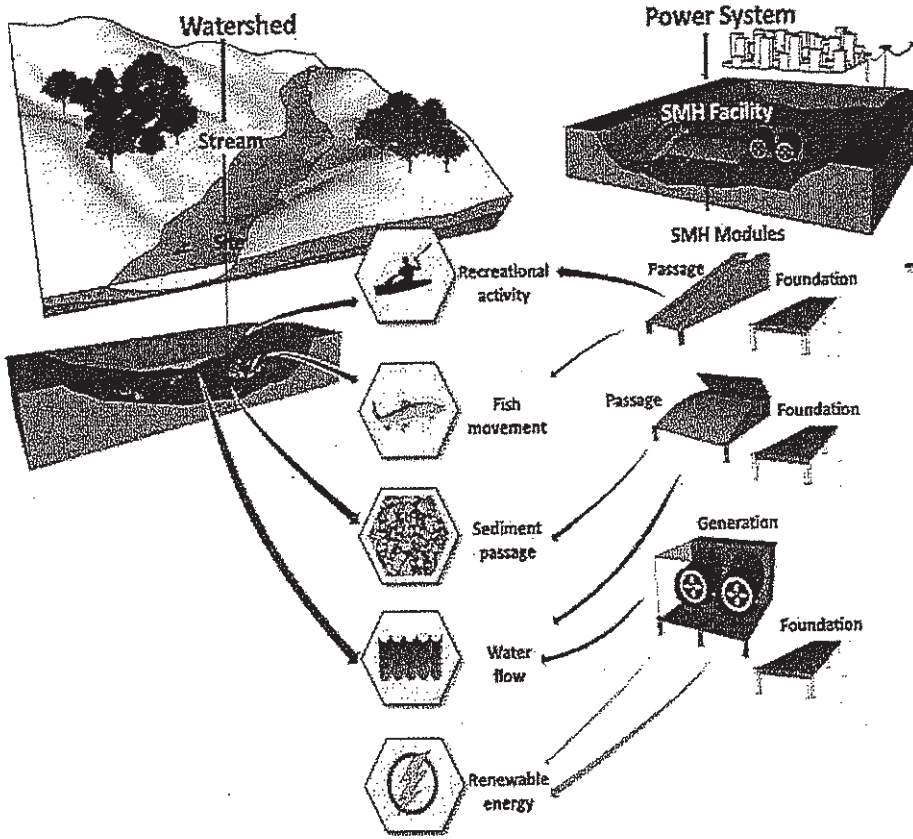


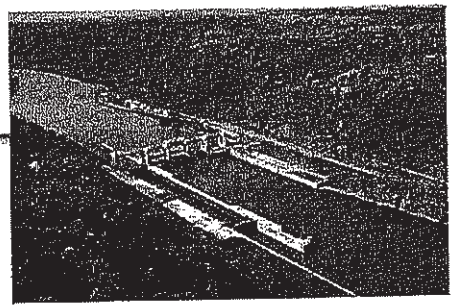


Reducing costs and unlocking new resources: DOE role

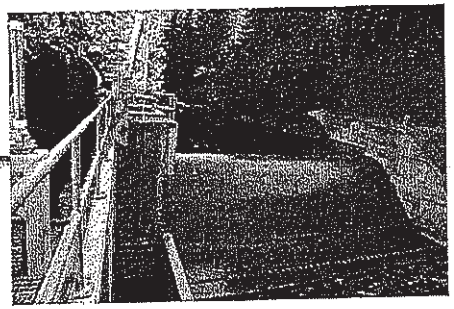
Standardized, modular hydropower designs are optimized for quick manufacturing and deployment, with ecosystem incorporated from the start

New Approaches to Designing and Developing New Hydro





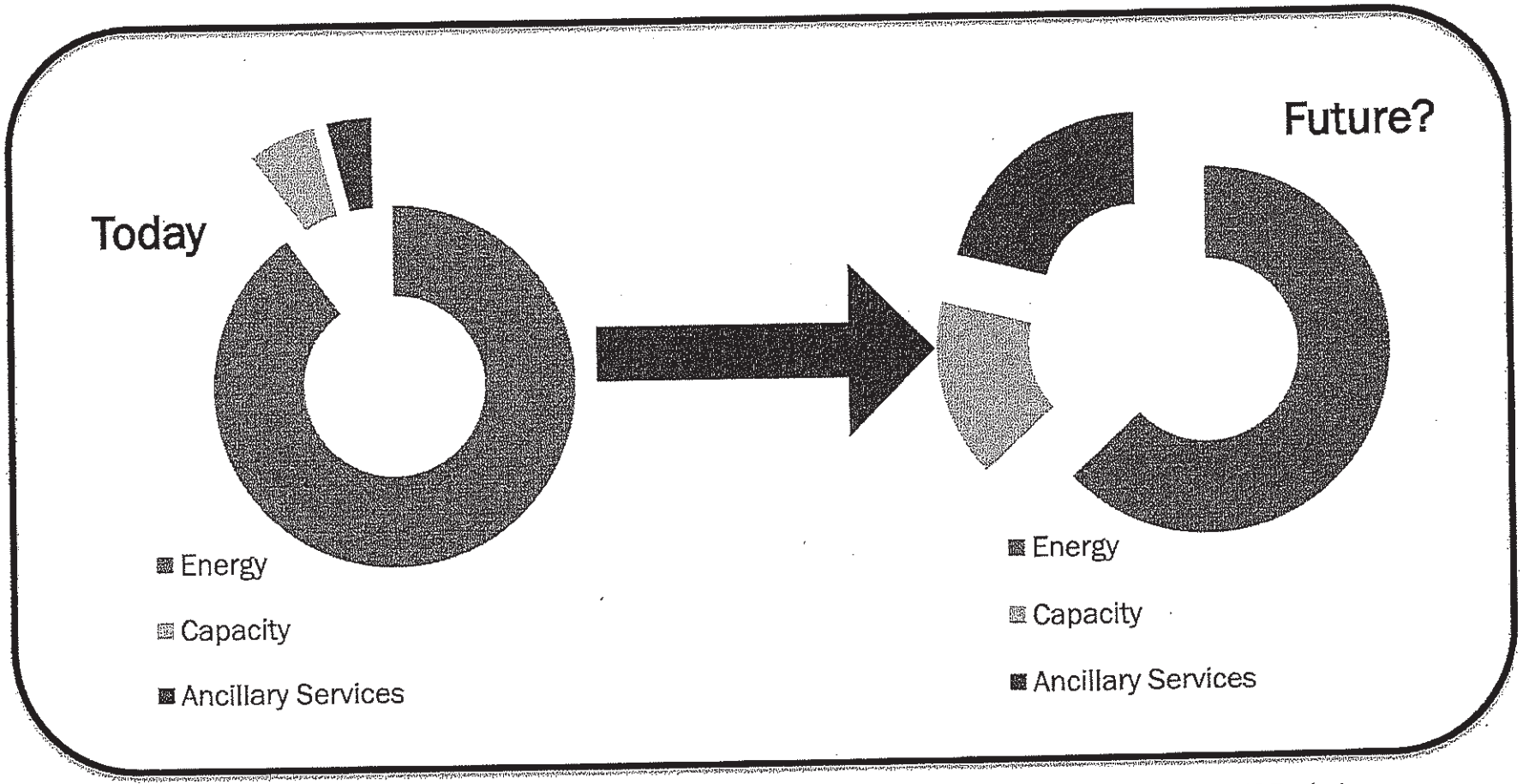
Non-Powered Dams and Conduits



New Low-Impact Projects

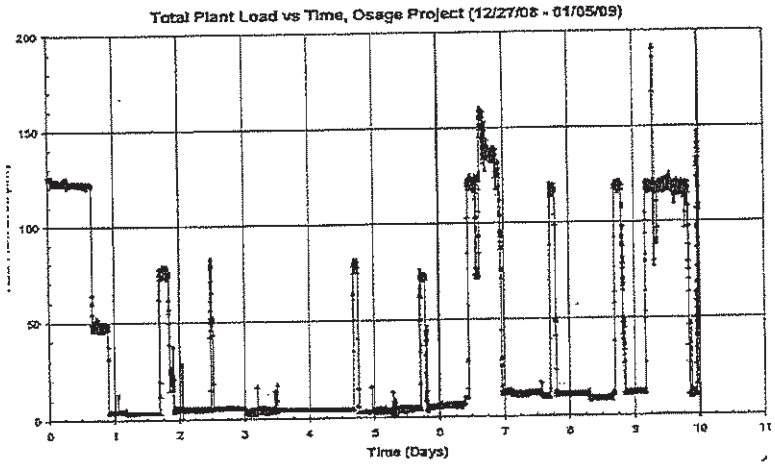
Grid flexibility, reliability and resilience

Challenges: hydropower's changing role

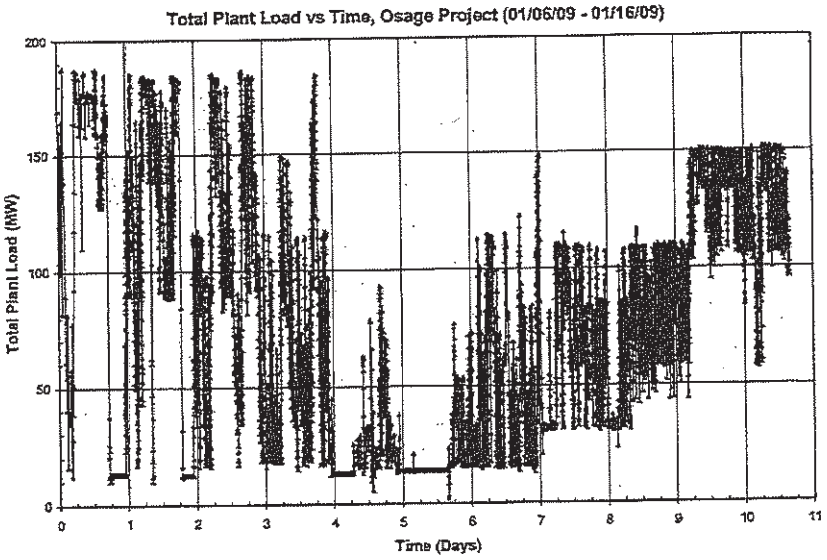


Source: Electric Power Research Institute (EPRI), *Capacity and Energy in the Integrated Grid*, EPRI, Palo Alto, CA: 2015 Product 3002006692, Available: https://www.epri.com/#/pages/product/000000003002006692/

Grid flexibility, reliability and resilience



Osage plant loads for 12/27/2008 – 1/5/2009



Osage plant loads for 1/6/2009 – 1/16/2009

Challenges: Existing hydropower and PSH systems often originally optimized to operate under very different conditions

- Significant gaps in information about the costs to hydro and PSH for operating to maximize grid reliability and resiliency
- Overall system benefits and need for these flexibility & reliability services and how they are valued/monetized is evolving.
- Hydropower flexibility is constrained by a range of variables including licensing requirements and competing water uses.
- Pumped storage and hydropower technologies not traditionally designed to optimize flexibility, and new PSH suffers from significant capital costs, lead time and permitting requirements

Grid flexibility, reliability and resilience: DOE role

WPTO supports research to evaluate and improve the ability of hydro and pumped storage to provide **essential flexibility and reliability services** for the rapidly evolving electric grid

- Understand baseline conditions for contribution to reliability and resiliency from hydro and pumped storage
- Gather data and assess the true costs of operating hydropower flexibly
- Expand/preserve flexibility of existing hydropower
- Improve capabilities to evaluate future grid system conditions and the necessary services that hydro and pumped storage are best suited to provide
- Support development of innovative hydropower and pumped storage technologies.

Request for Information

https://eere-exchange.energy.gov/default.aspx#Foaldc7e629f0-7127-43df-a13b-6a5da7a38b3a

DE-FOA-0001886: RFI: Expanding Hydropower and Pumped Storage's Contribution to Grid Resiliency and Reliability

Topics:

- Hydropower Capability, Operational Impacts, and Costs
- Current Operations Landscape
- Role and Value of Hydropower in Future Power Systems
- Additional Research Needs

Environmental R&D & System Optimization

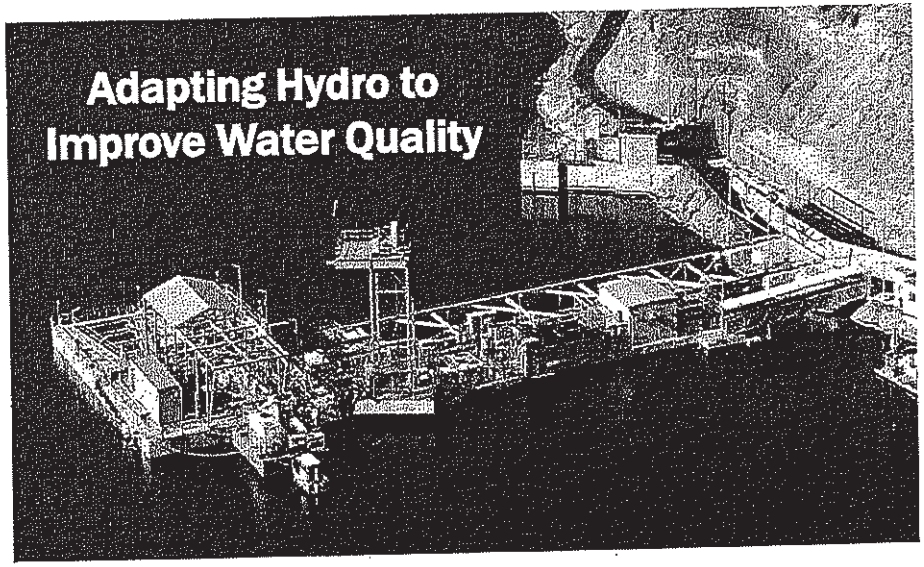
Challenges: Hydropower units can cause ecosystem impacts, and regulatory processes are cost and time intensive

- Technologies to meet existing license requirements are expensive and can be improved
- Limited data exists about the steps involved in the regulatory process, and the conditions that trigger individual study requirements are unpredictable
- The many uses of/for water itself complicate development and operation
  - Need better ways to analyze these complexities, evaluate role of hydro within other uses, understand potential future systems-level risks that can add additional complexities
  - Analytical challenge within licensing process of evaluating **tradeoffs**, and management objectives (environmental, recreational, irrigation, etc.) are changing, sometimes unclear and difficult to reconcile
  - Balancing the environmental objectives (reducing environmental impacts of some hydro facilities) is a true technological and scientific challenge

Only 8 small hydropower plants received an original FERC license in the past 15 years, and the average time to receive a license was nearly 5 years
(2017 Hydro Market Report)

Environmental R&D & System Optimization: DOE role

Over the last century, American hydropower has improved its ability to mitigate environmental risk, and continuing to do so will help drive down operation costs and permitting timelines. WPTO supports research to **improve environmental performance, reduce regulatory delays** for existing and future hydropower technologies, and evaluate system-level risks & opportunities for hydropower and other water uses.

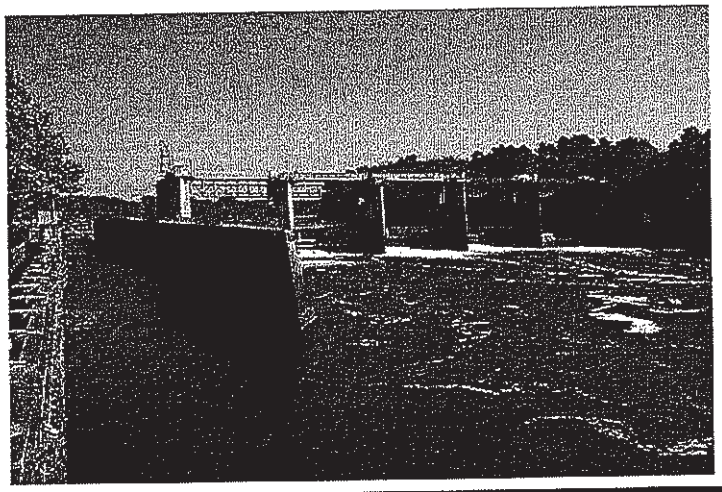


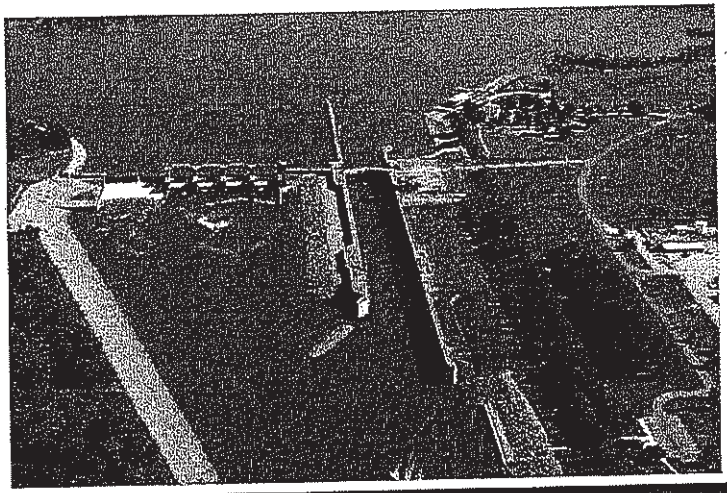
- Design new hydropower systems that minimize or avoid environmental impacts
- Optimize technical, environmental, and water-use efficiency of existing fleet
- Develop technologies, tools, and strategies to evaluate and address environmental impacts
- Support development of new fish passage technologies and approaches. For example, WPTO just awarded $2.5M to four projects developing fish passage solutions.
- Facilitate interagency collaboration to increase regulatory process efficiency

Improve Environmental Performance of Hydropower: Fish Passage Solutions at Hydropower Dams

$2.5M Funding Opportunity (closed on Dec. 20th, 2017)

- Funding for research on **innovative upstream and downstream solutions to provide effective fish passage** through hydropower dams, **while reducing construction and operation costs**
- Funded research will provide basic information and data on:
  - New innovative technologies that can utilize advanced manufacturing technologies;
  - encourage advances in detection, sorting, and counting techniques that can be applied to fish passage structures;
  - and support improvements in fish guidance and attraction to optimize passage





Data Sharing and Analysis: Hydropower Fleet Intelligence

What?

Coordination and coherence of dispersed data on hydropower asset performance

- Reliability and outage reporting
- Operation and maintenance cost benchmarking
- Equipment inspection and testing results
- Maintenance activities
- Forecast, dispatch, operations, and water data
- Condition monitoring data

Who?

Used by…

- Asset owners, managers, and electric utility planners
- Electric power system operators and planners
- Regulators
- Policy analysts and policy-makers
- Researchers

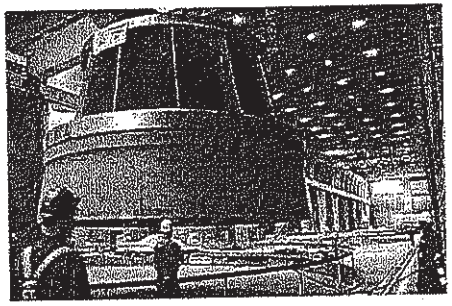
Why?

For…

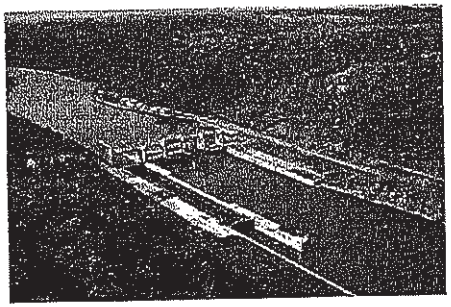
- Decisions that maximize hydropower reliability and value
- Understanding hydropower fleet responses to future conditions and decisions
- Transparency and provenance of analyses, rationale, and decision-making
- Ensuring that policies are science- and data-driven

Water Power: Many Different Opportunities

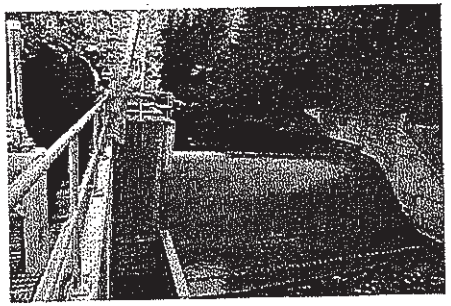
Marine and Hydrokinetics



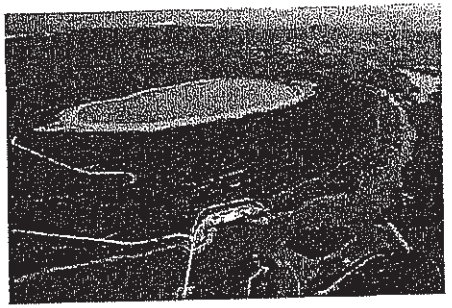
Upgrades for Existing Hydropower



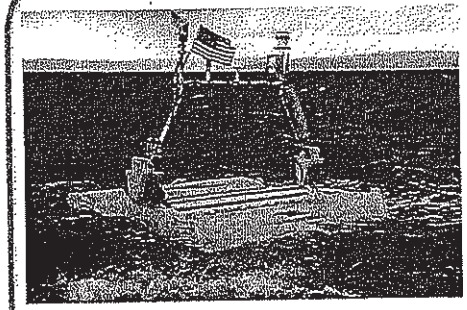
Non-Powered Dams and Conduits



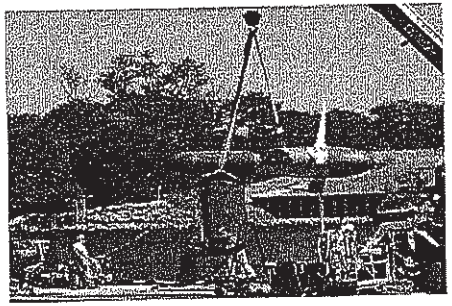
New Low-Impact Projects



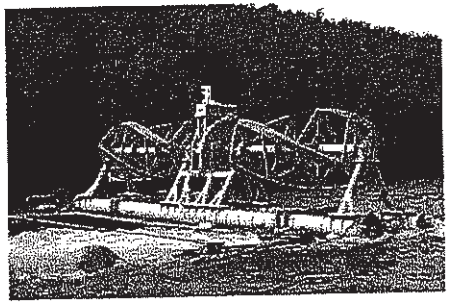
Pumped Storage



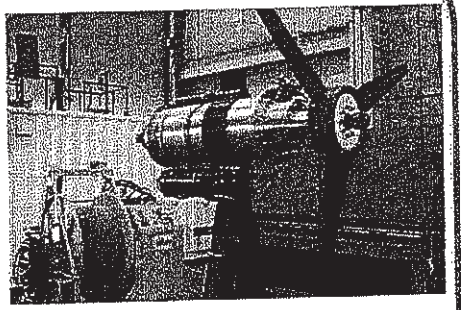
Wave



Tidal

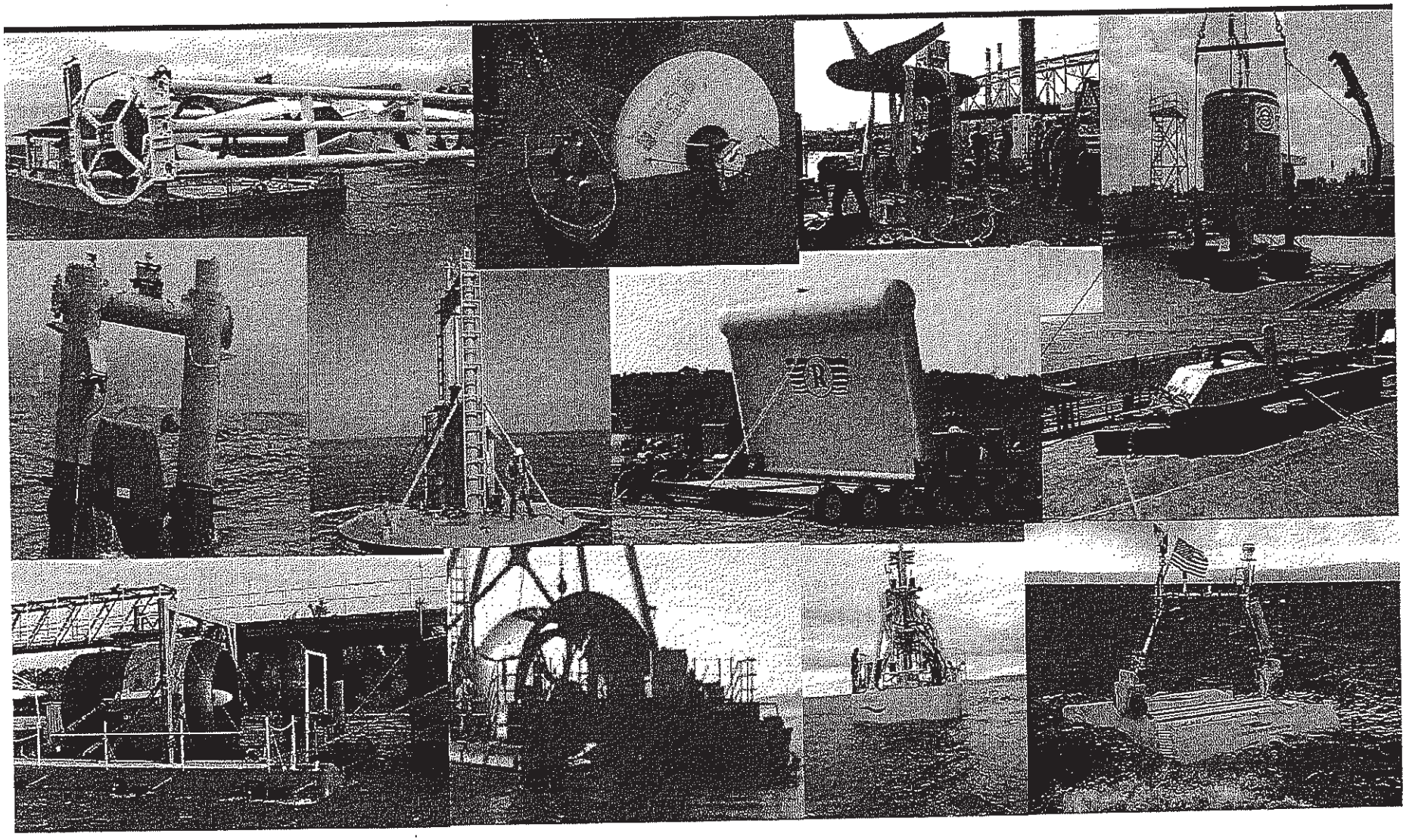


River Current



Ocean Currents

Marine and hydrokinetic energy today

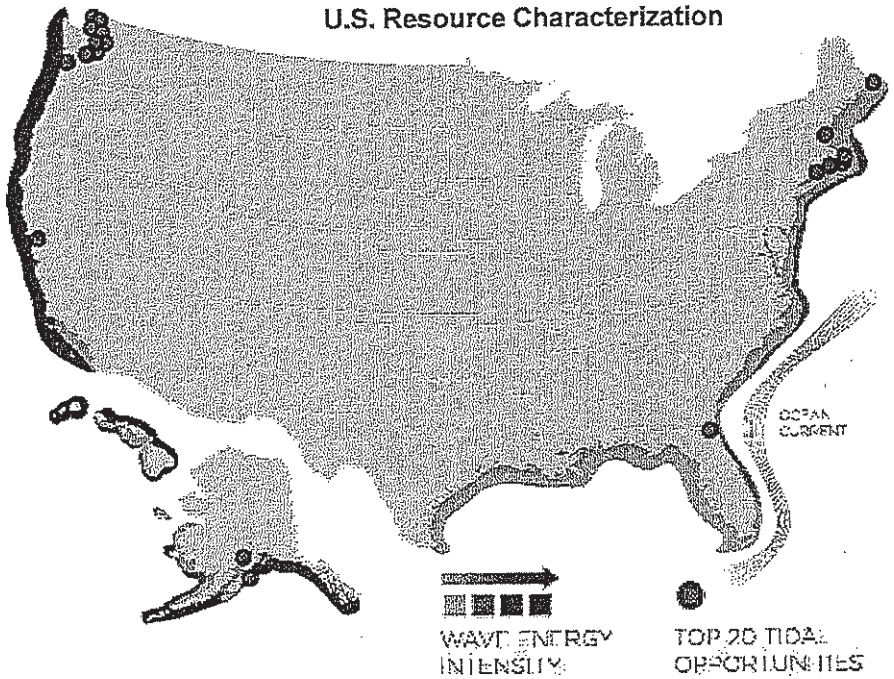


A big opportunity...

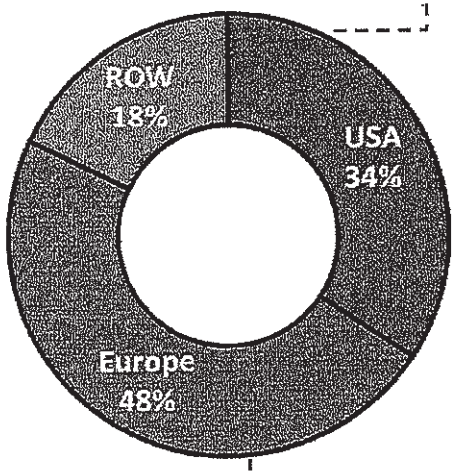
Resource	Total US Theoretical Resource		Total US Technical Resource		CONUS Technical Resource	
	TWh/year	% 2012 U.S. Net Electricity Generation	TWh/year	% 2012 U.S. Net Electricity Generation	TWh/year	% 2012 U.S. Net Electricity Generation
Wave Energy (2,3)	1594-2640	39-65	898-1229	22-30	378-472	9-12
Tidal Current Energy (4)	445	11	222-334	5.5-8.2	15-22	0.4-0.5
Ocean Current Energy (5)	200	4.9	45-163	1.1-4.0	45-163	1.1-4.0
River Current Energy	1381	34.1	120	3	100	2.5
Total	3620-4666	89-115	1285-1846	31.6-45.2	538-757	13-19

The U.S. industry accounts for approximately 34% of all marine energy companies in the world.

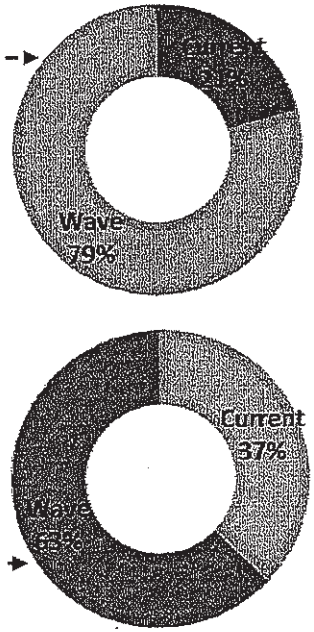
U.S. Resource Characterization



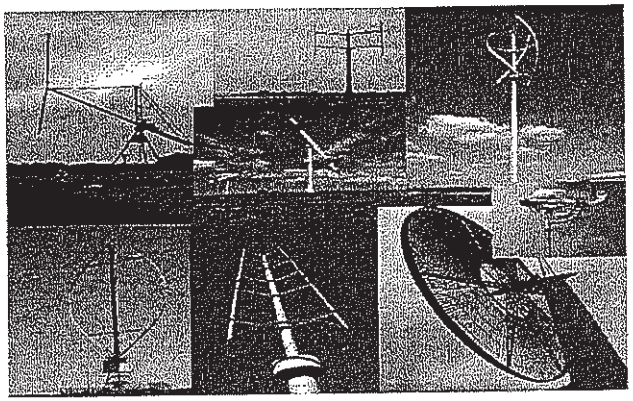
Number of Marine Energy Companies by Region

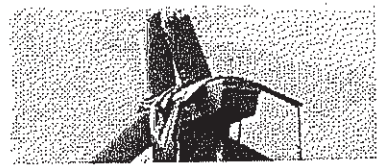


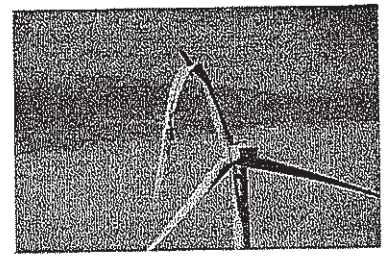
Marine Energy Companies by Field

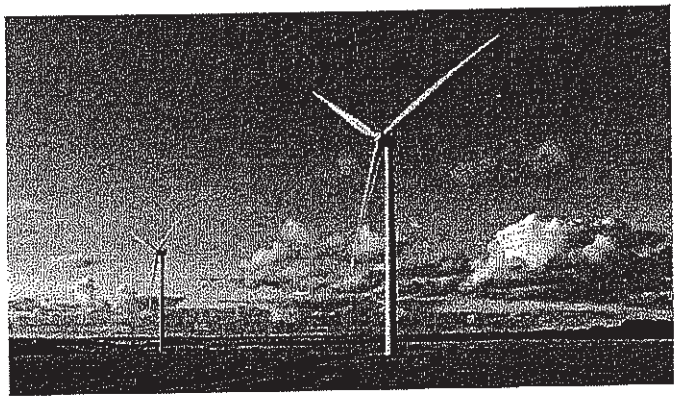


... but still a ways from technology convergence

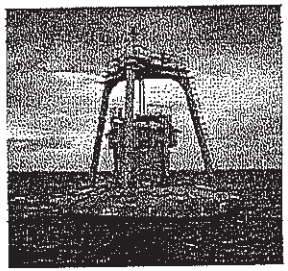


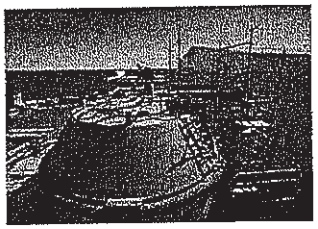


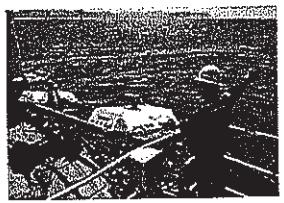


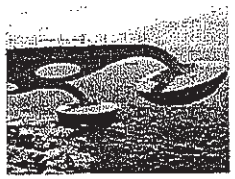


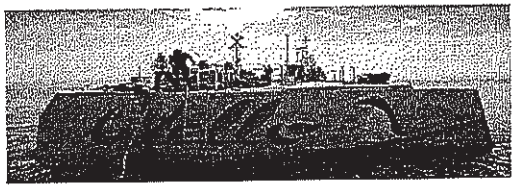


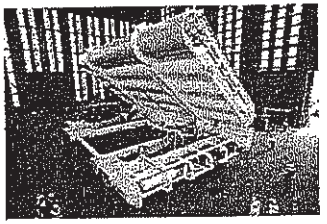


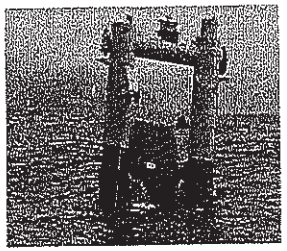


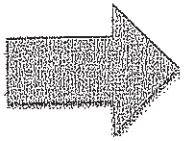












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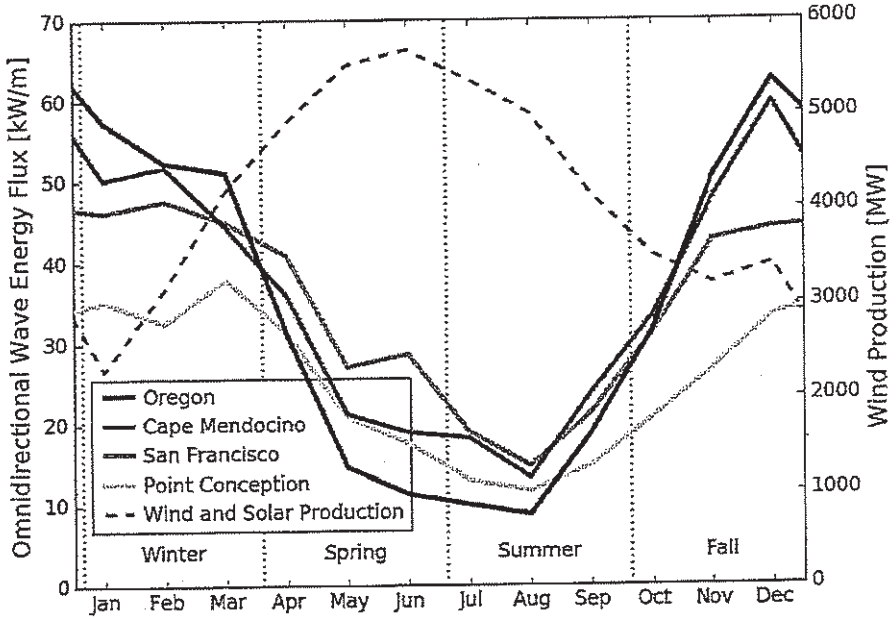
Marine renewable energy has a value proposition beyond a kilowatt-hour

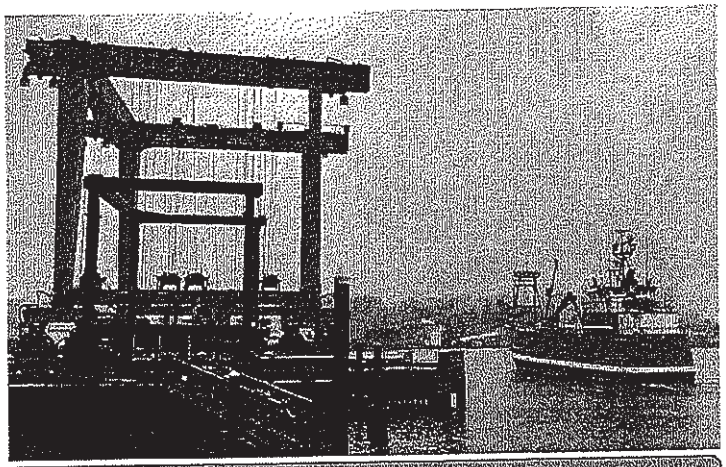
1. **Locational value** – can be in proximity to large load with no existing or potential transmission access

2. **Predictability and integration** – marine energy's relative predictability reduces integration costs

3. **Generating profile** – seasonal complementarity with wind and solar

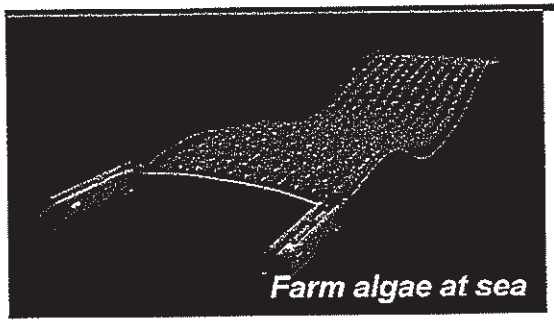
4. **Resiliency** – may be one of few solutions available to coastal electric service providers

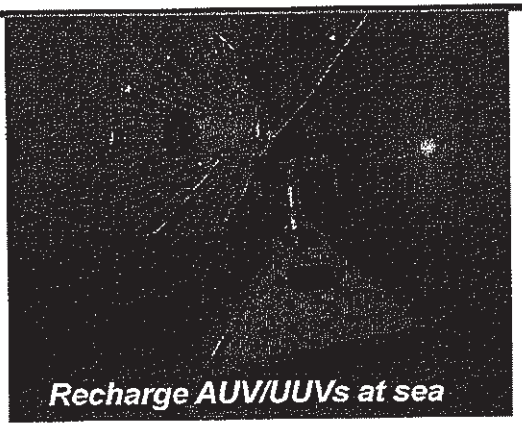


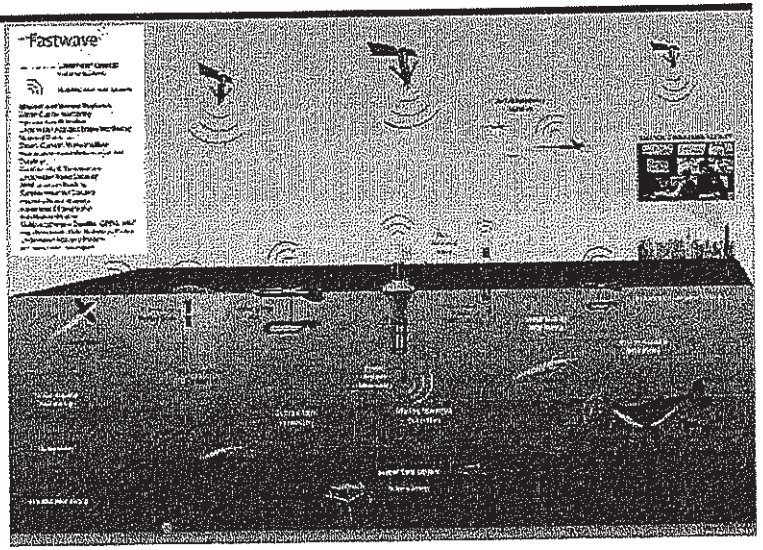


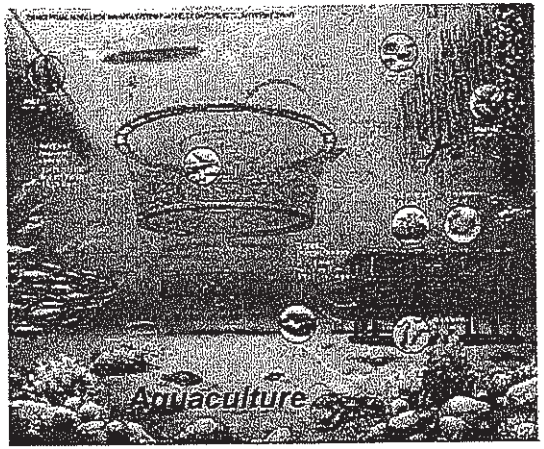
Boatyard in Toledo, Oregon, with high capacity lift

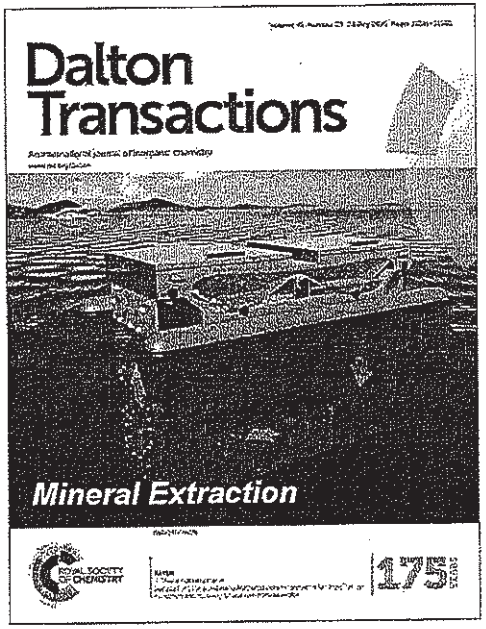
As well as benefits beyond utility scale power

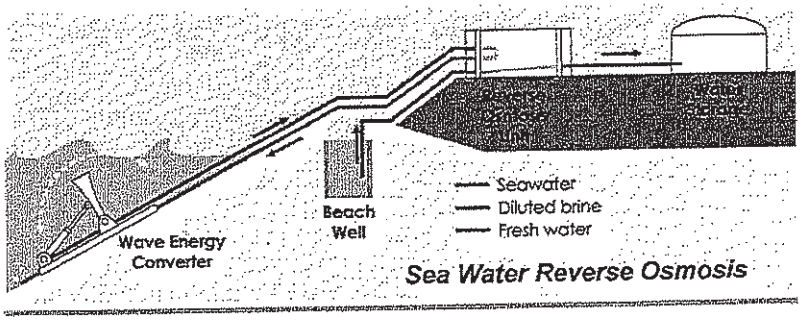






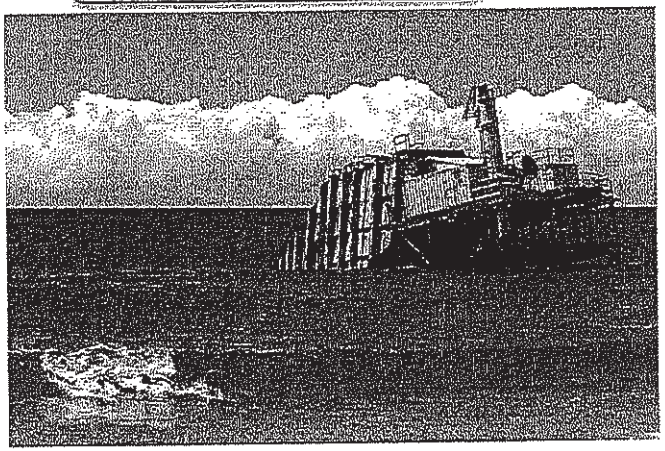




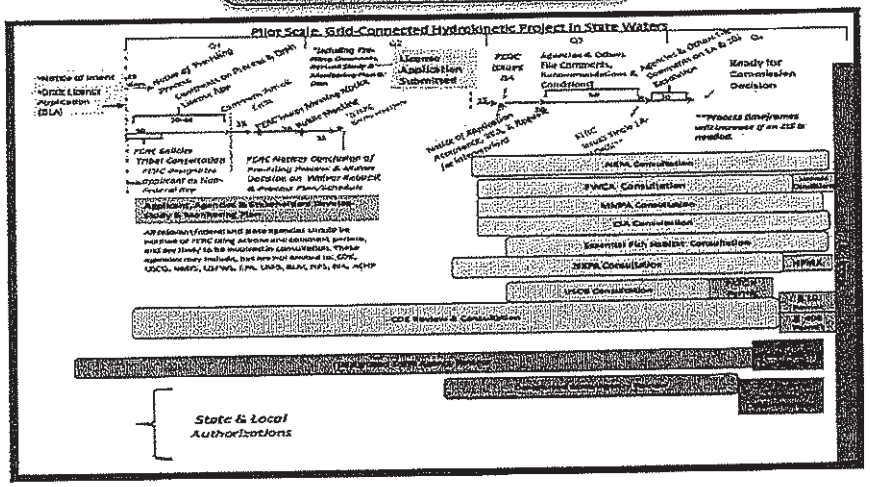


Challenges to developing MHK

Difficult Engineering



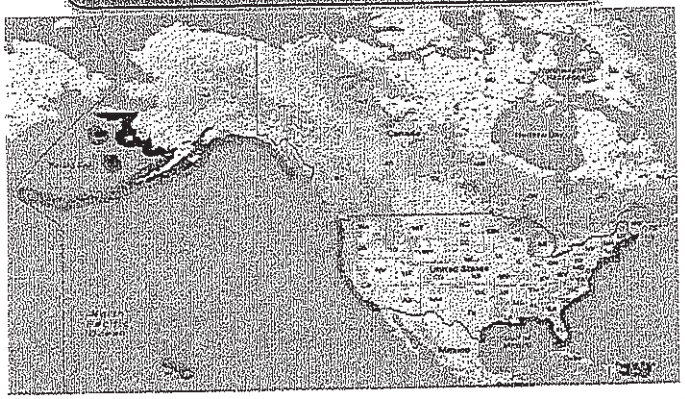
Prolonged Design and Testing Cycles



Installing and Operating Reliable Systems



Technology / Market Information & Supply Chains



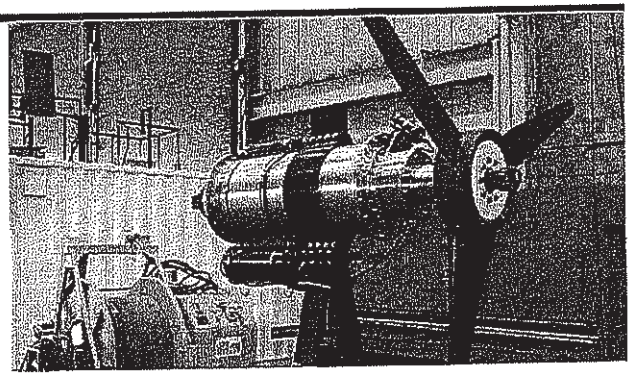
WPTO MHK Program's Approaches

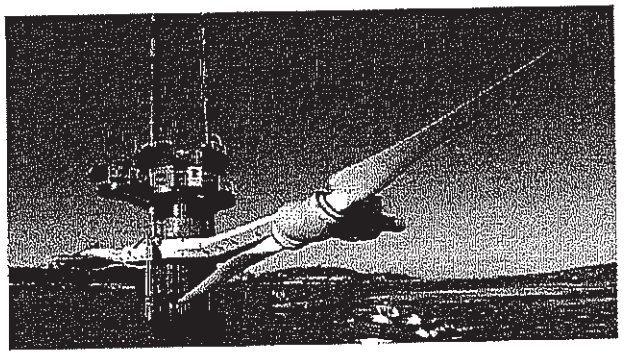
- **Foundational and Crosscutting R&D**: Support the design and development of marine and hydrokinetic devices and components in both laboratory and open-water settings
- **Technology-Specific Design and Validation**: Develop tools and models that support the design, development, and optimization of marine and hydrokinetic devices
- **Reducing Barriers to Testing**: Enable industry access to world-class testing facilities, support interagency coordination to identify potential improvements to regulatory processes
- **Data Sharing and Analysis**: supply objective data and analysis, often based on information collected over the course of other WPTO research efforts, to decision makers and important MHK industry stakeholders

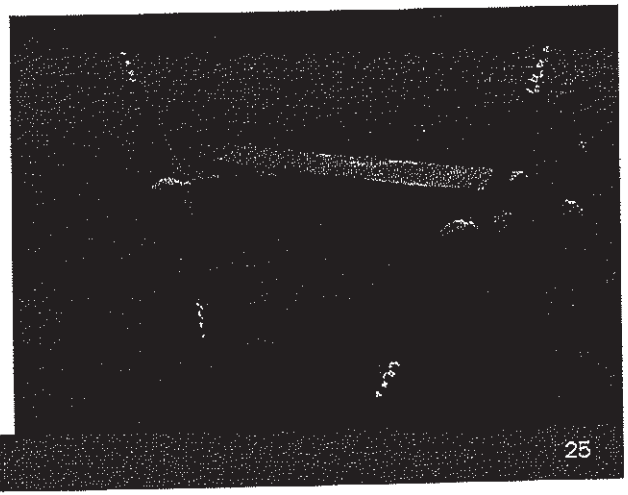


Foundational and Crosscutting R&D: DOE role

- Drive innovation in components, controls, manufacturing, materials and systems with R&D specific to MHK applications
- Develop, improve, and validate numerical and experimental tools and methodologies needed to improve understanding of important fluid-structure interactions
- Improve MHK resource assessments and characterizations needed to optimize devices and arrays, and understand extreme conditions
- Collaboratively develop and apply quantitative metrics to identify and advance technologies with high ultimate techno-economic potential for their market applications

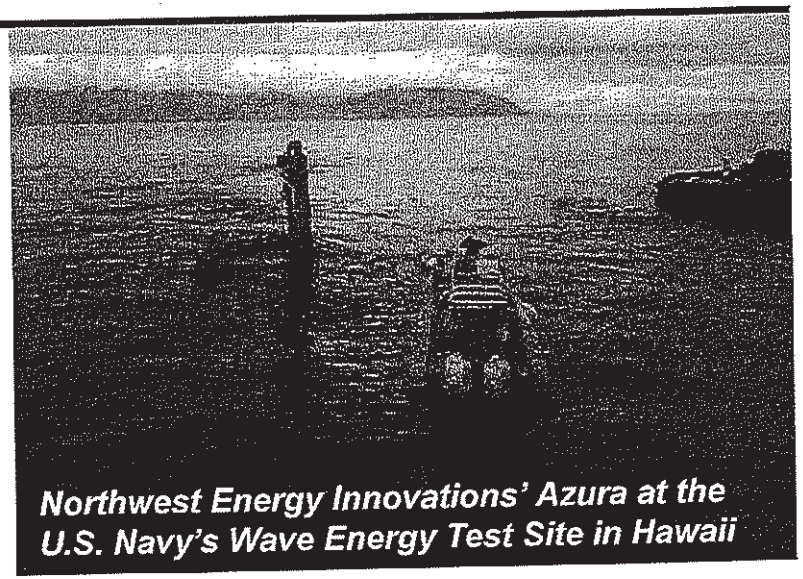




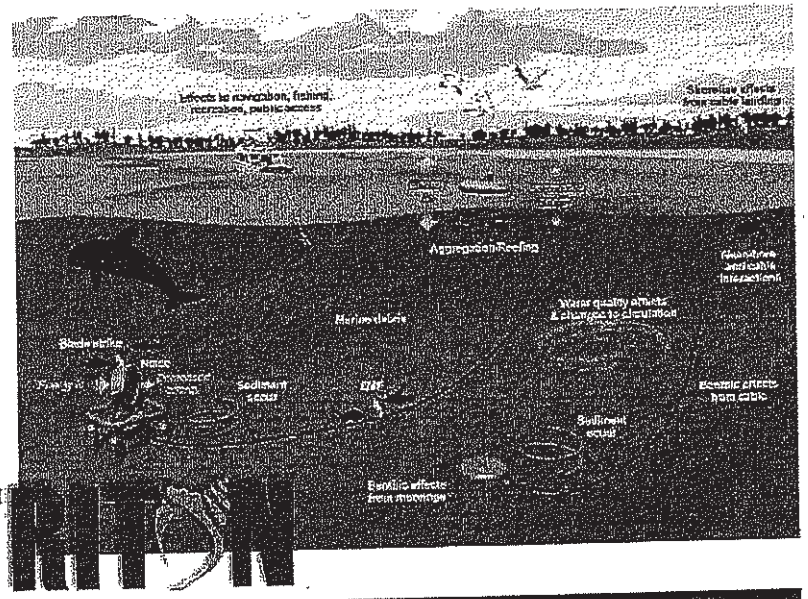


Technology-Specific Design and Validation: DOE role

- Validate performance and reliability of systems by conducting in-water tests of industry-designed prototypes at multiple relevant scales
- Improve methods for safe and cost efficient installation, grid integration, operations, monitoring, maintenance, and decommissioning of MHK technologies
- Support the development and adoption of international standards for device performance and insurance certification
- Evaluate current and potential future needs for MHK-specific IO&M infrastructure (vessels, port facilities, etc.) and possible approaches to bridge gaps

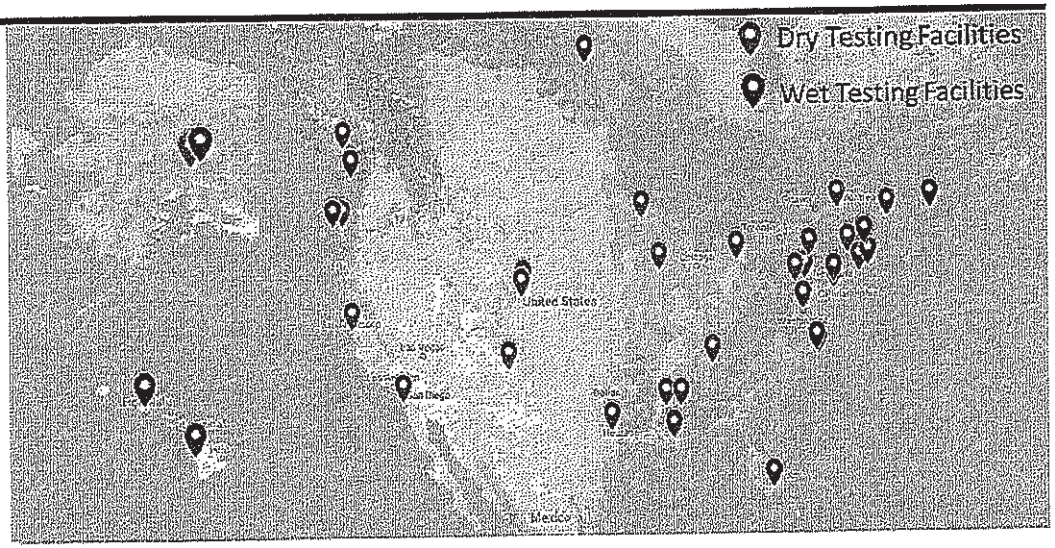


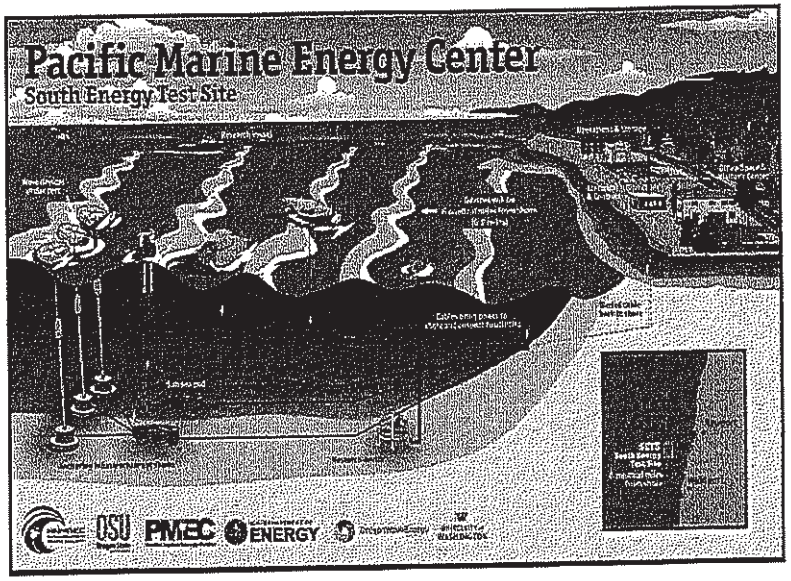
Northwest Energy Innovations' Azura at the U.S. Navy's Wave Energy Test Site in Hawaii



WPTO Approach: Reducing Barriers to Testing

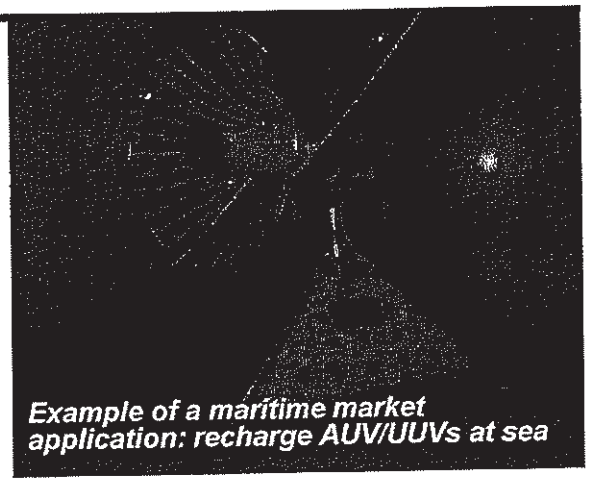
- Enable access to world-class testing facilities that help accelerate the pace of technology development
- Work with agencies and other groups to ensure that existing date is well-utilized and identify potential improvements to regulatory processes and requirements
- Support additional scientific research as needed, focused on retiring or mitigating environmental risks and reducing costs and complexity of environmental monitoring
- Engage in relevant coastal and marine planning processes to ensure that MHK development interests are considered



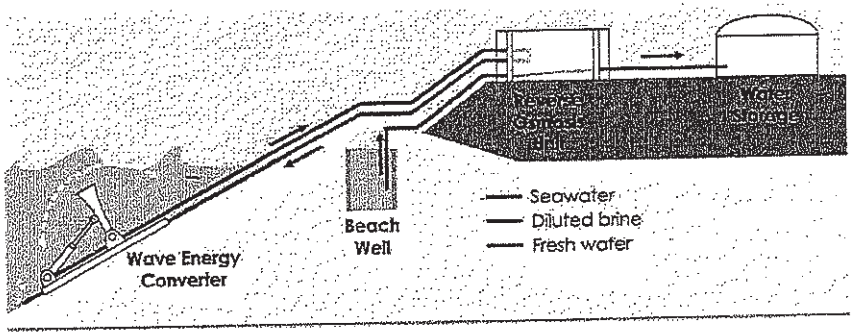


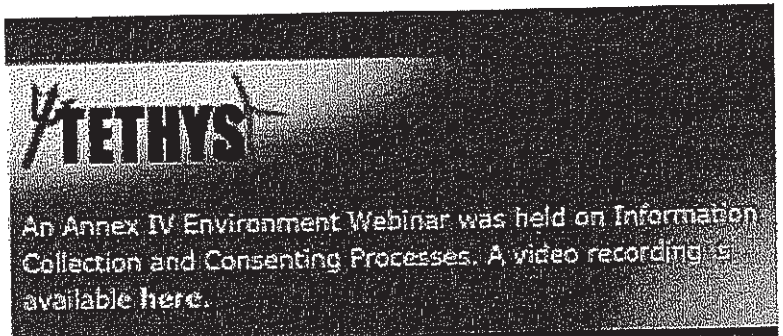
Data Sharing and Analysis: Marine Energy

- Provide original research to assess and communicate potential MHK market opportunities, including those relevant for other maritime markets (e.g. desalination, powering subsea sensors, charging for underwater vehicles)
- Aggregate and analyze data on MHK performance and technology advances, and maintain information sharing platforms to enable dissemination
- Support the early incorporation of manufacturing considerations/information into design processes
- Leverage expertise, technology, data, methods, and lessons from the international MHK community and other offshore scientific & industrial sectors (e.g. offshore wind, oil and gas)



Example of a maritime market application: recharge AUV/UUVs at sea





Data Sharing and Analysis: HydroWISE

HydroWISE℠
U.S. DEPARTMENT OF ENERGY

- **New website for all DOE water power-related resources and research results , in one location**
- Information is sourced from industry and five national laboratories: Argonne National Laboratory, Idaho National Laboratory, National Renewable Energy Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory
- Four main categories for fast data access:
  - Infrastructure
  - Environmental, Sustainability, Regulatory
  - Technology Development
  - Markets and Values
- For More Information: **hydrowise.ornl.gov**

Data
Review comprehensive facts and statistics for reference and analysis.

Tools & Maps
Choose from a variety of research tools and maps related to hydropower technology development, hydropower facilities, and other U.S. resources.

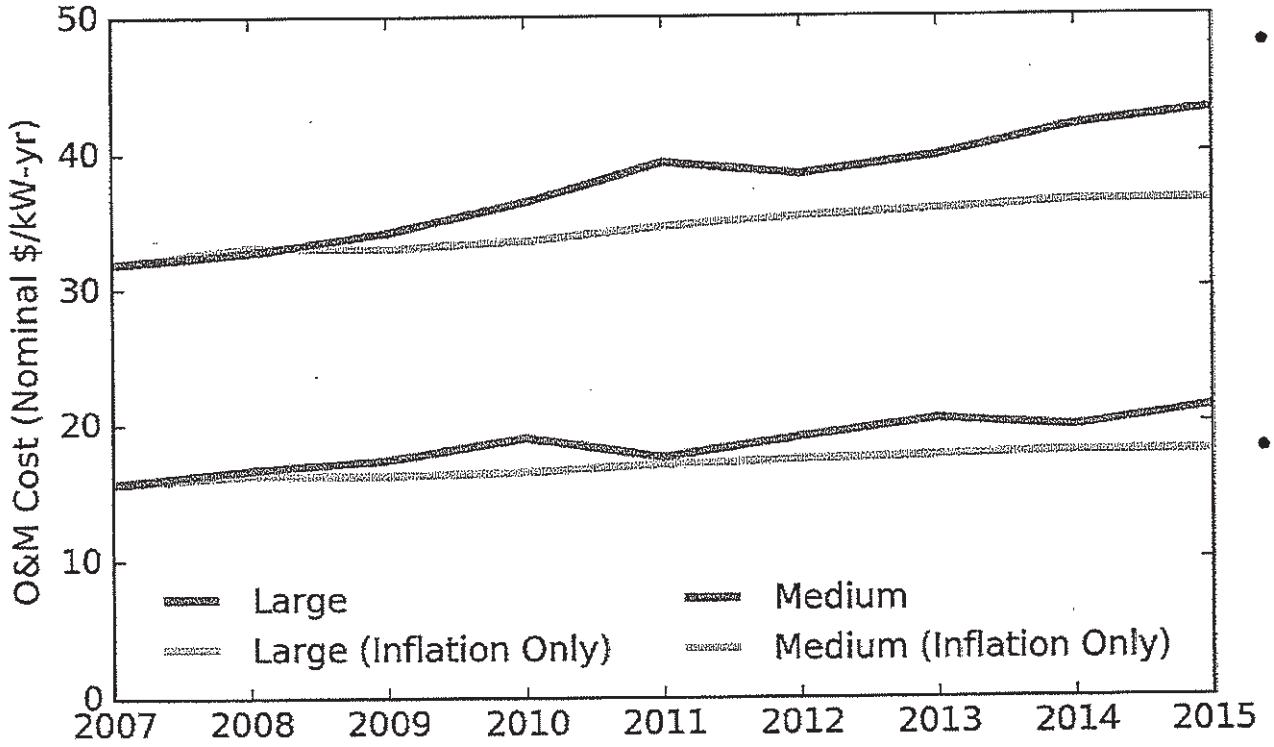
Publications
Locate hydropower research publications from the Energy Department's national laboratories and search by location, theme, and topic.

Projects
Research hydropower projects to see progress related to infrastructure, technology development, and analytics across the nation.



Data Sharing and Analysis: Hydropower Market Report

WPTO Hydropower Market Report, 2017: Since 2007, **growth in O&M cost has outstripped inflation.**



- Data from 189 Large (100-500 MW) and Medium (10-100 MW) capacity projects (representative set of whole U.S. fleet)
- +35% cost increase for Medium and Large projects; only +14% increase in consumer price index

WPTO: Major FY18 Activities

Hydropower Program

- **FY18 Hydropower FOAs:** As outlined in the President's Budget Request, $2 million in funding will be made available to support early stage conceptual design development of advanced 'standardized, modular hydropower' (SMH) technologies. Per Congressional direction, $10 million will also be made available for a competitive solicitation focused on development, testing and analysis of advanced pumped-storage technologies.
- **Hydropower Regulatory Process Analysis:** ORNL and NREL will conduct a scientific analysis of the hydropower regulatory process with the goal of providing new data to all hydropower stakeholders – including developers, regulators and NGOs – on the factors that may contribute to multiyear delays and resulting economic impacts associated with hydropower licensing processes.
- **New Hydropower Valuation Research Initiative:** Launching a new research initiative with five national labs to understand and drive utilization of the full potential of hydroelectric and pumped-storage resources to contribute to electric reliability and resiliency, now and into the future. Issued RFI to solicit feedback on priorities (closed April 6th). Will also soon be releasing a Notice of Technical Assistance (NOTA) for techno-economic assessments of new proposed pumped-storage projects .

MHK Program

- **FY18 MHK FOA:** Up to $22.3 million in funding available for next generation marine energy technology research, including technology advancement through early-stage device design, controls and power take-off design and system integration, and better dissemination of environmental data and analyses to regulators . [Notice of Intent released April 10th]
- **The Pacific Marine Energy Center South Energy Test Site (PMEC-SETS):** Finalize permitting and continue development of the grid-connected, full-scale test facility for wave energy conversion technologies—the first of its kind in the United States. [fully-funded with prior FY dollars]
- **Maritime Market Opportunities for MHK:** In addition to ultimately providing utility-scale power, MHK has the opportunity to provide on-site, reliable, least-cost power for a wide range of other ocean applications and industries . Understanding the requirements of these industries and the implications for system design and operations are a critical step in determining R&D priorities. A Request for Information (RFI) is planned for release at the end of April to solicit feedback on a new report on these opportunities for MHK technologies.

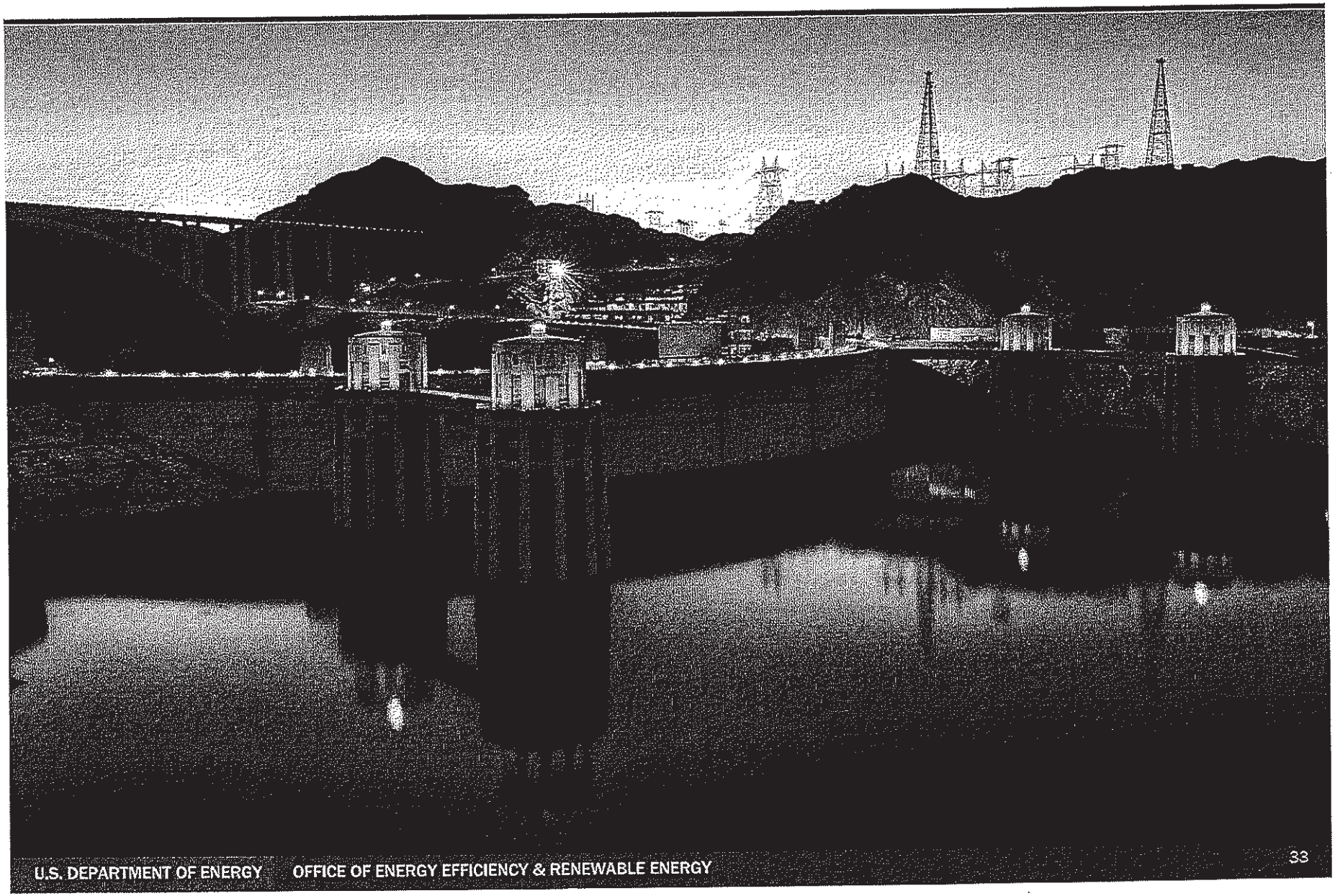
FY19 President's Budget Request

- $45M for Water Power in FY19, including hydropower and marine energy
- EERE proposed "Beyond Batteries" initiative to explore storage alternatives includes $20M for Water Power

($ K)

Energy Efficiency and Renewable Energy	FY 2017 Enacted	FY 2018 Enacted	FY 2019 Request	FY 2019 Request vs FY 2018 Enacted	
				$	%
Sustainable Transporation					
Vehicle Technologies	306,959	337,500	(b) (5)		-79.7%
Bioenergy Technologies	205,000	221,545			-83.3%
Hydrogen and Fuel Cell Technologies	101,000	115,000			-49.6%
Total, Sustainable Transportation	**612,959**	**674,045**			**-75.7%**
Renewable Energy					
Solar Energy	207,600	241,600			-72.3%
Wind Energy	90,000	92,000			-64.1%
Water Energy	84,000	105,000			-57.1%
Geothermal Technologies	69,500	80,906			-62.9%
Total, Renewable Energy	**451,100**	**519,506**			**-66.3%**
Energy Efficiency					
Advanced Manufacturing	257,500	305,000			-75.4%
Federal Energy Management Program	27,000	27,000			-63.0%
Building Technologies	199,141	220,727			-74.2%
Weatherization and Intergovernmental Activities	278,000	306,000			-100%
Total, Energy Efficiency	**761,641**	**858,727**			**-83.5%**

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Find us at: Water.Energy.Gov

DOE's role in addressing some of the challenges to hydropower

DOE's *Hydropower Vision* set forth priority pathways identified by industry, environmental groups, and other hydropower stakeholders as the necessary steps to realize the full potential benefits of hydropower in the U.S. These pathways involve strengthening the body of knowledge that enables industry to develop and deploy new technologies, quantify the value of grid reliability services, address regulatory requirements, and maintain and improve the sustainability of U.S. hydropower assets. While it does not engage in every activity suggested in the Vision roadmap, **DOE leads in areas where government R&D is appropriate and most effective.**

R&D efforts focus on areas where hydropower turbine manufacturers and hydro-owning utilities are unlikely or unable to spend private capital. This typically includes the **initial conceptual design, and numerical modeling and validation of technologies** that can subsequently be adopted by industry for further development and commercialization.

WPTO's hydropower **R&D efforts are closely coordinated with the Federal agencies** that own and operate half of the hydropower capacity in the U.S.

WPTO provides one-of-a-kind unit, plant and integrated river-basin level data and analysis across the hydropower fleet, essential to inform the critical R&D needed for future hydropower growth, the optimization of operations of the existing projects, and priority areas of regulatory process improvements.

DOE's role in addressing some of the challenges to MHK

Industry deployment of MHK technologies for bulk power generation is nascent, and significant research and development is required to realize cost-competitiveness for MHK technologies.

WPTO invests in early-stage R&D with a focus on design concepts that have the potential to increase energy capture and annual energy production of devices, improve reliability and availability, and reduce capital and operating and maintenance costs if further developed by industry.

To move MHK technologies beyond small-scale prototypes, **it is necessary to carry out in-water validation of performance, efficiency, and reliability**. **This validation is generally beyond the capacity of pioneering technology companies that comprise the industry** as it is expensive and time consuming due to the unique challenges of the marine environment. WPTO partners with industry to support the development and testing of early-stage prototypes, as well as to make available dedicated testing infrastructure to reduce the inefficiency associated with each developer investing in its own separate testing cables and permits.

DOE makes the results of in-water tests broadly available to ensure knowledge generated through public funding is accessible. **WPTO disseminates both new data and existing data that would not otherwise be available** to resource agencies, regulators, developers, and researchers.

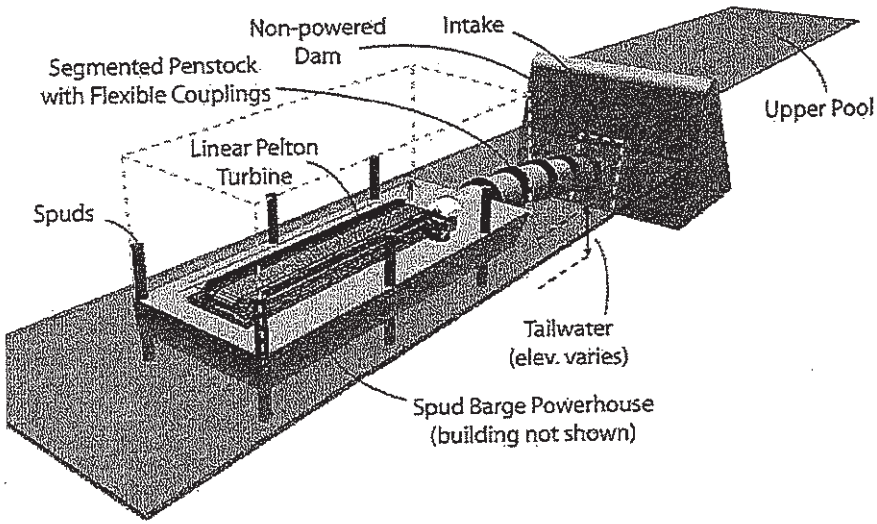
Also, WPTO is supporting the development of first-ever national wave classification metrics and site-specific wave energy characterization. **This work is similar to much of what DOE has provided historically for the wind and solar industries** including national maps and dynamic resource predictions. This type of national level, unbiased information is essential both to helping the industry make informed project siting decisions and to informing device design and DOE's own R&D priorities.

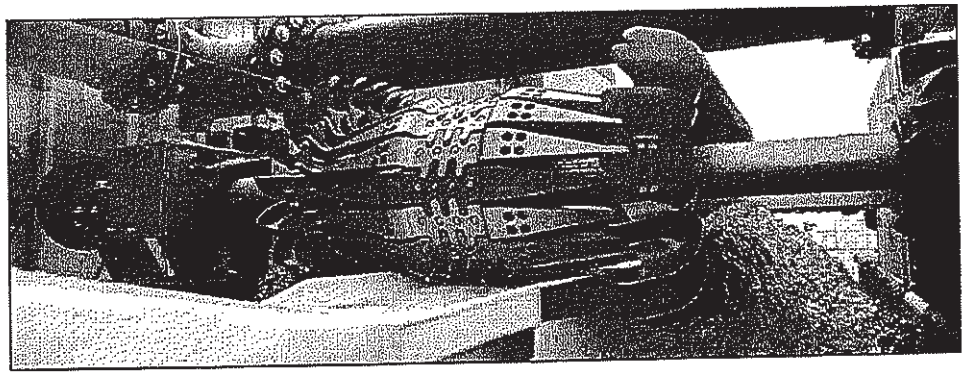
Example - Technology R&D for Growth (HydroNext): Cost effective technologies for development of non-powered dams

Efficient, Modular Low-Head Linear Pelton Turbine with Simple, Low-Cost Civil Works

Performer: Natel Energy, Inc.

- Natel is working to design, build, and test a **modular low-head linear pelton turbine**;
  - Pelton-style buckets attach to a scalable linear powertrain
  - No wicket gates or draft tube
  - Integrates well with non-powered dams with **minimal construction costs**
  - **Floating powerhouse** can rise and fall with natural tailwater fluctuations
- The technology has potential for 80% water-to-wire efficiency, 80% reduction in civil works cost, and useful at 80% of the non-powered dams market





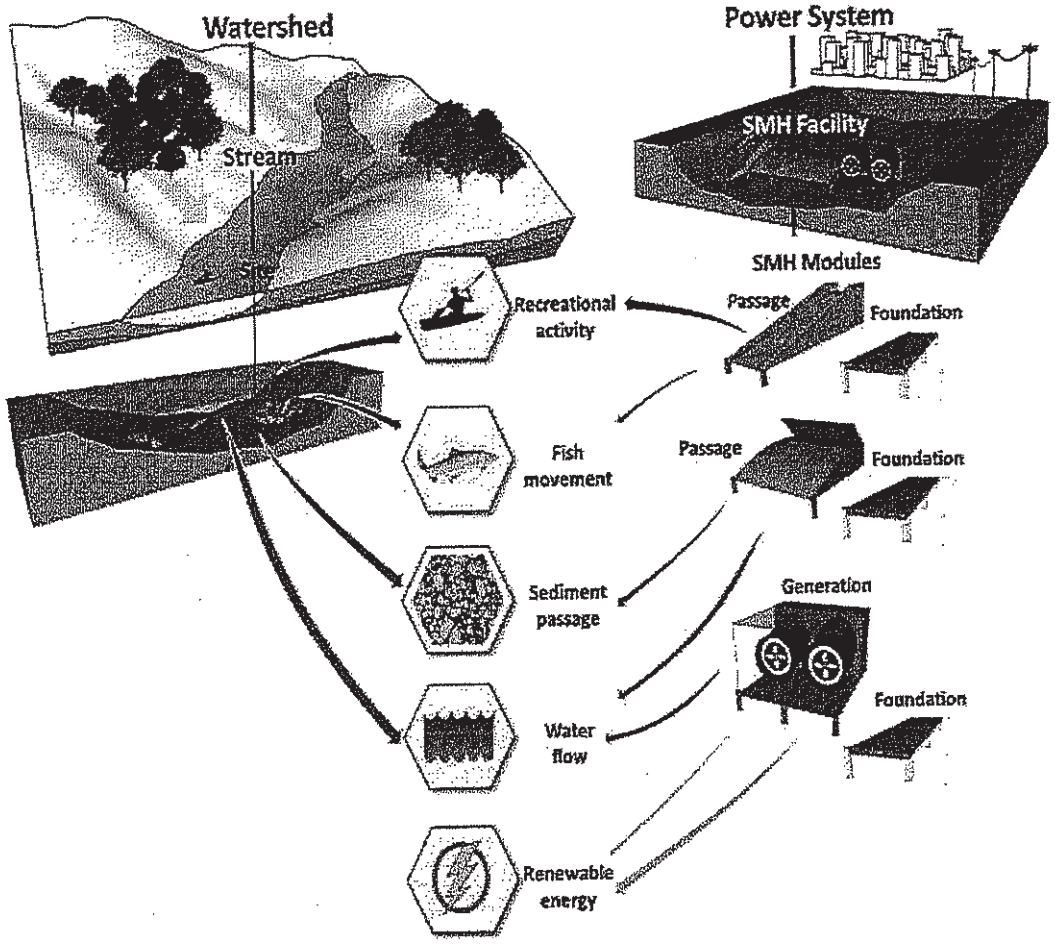
Example - Technology R&D for Growth (HydroNext): New design philosophies for new stream-reach hydropower development

Standard Modular Hydropower Technology Acceleration

New Approaches to Designing and Developing New Hydro

Lab: ORNL

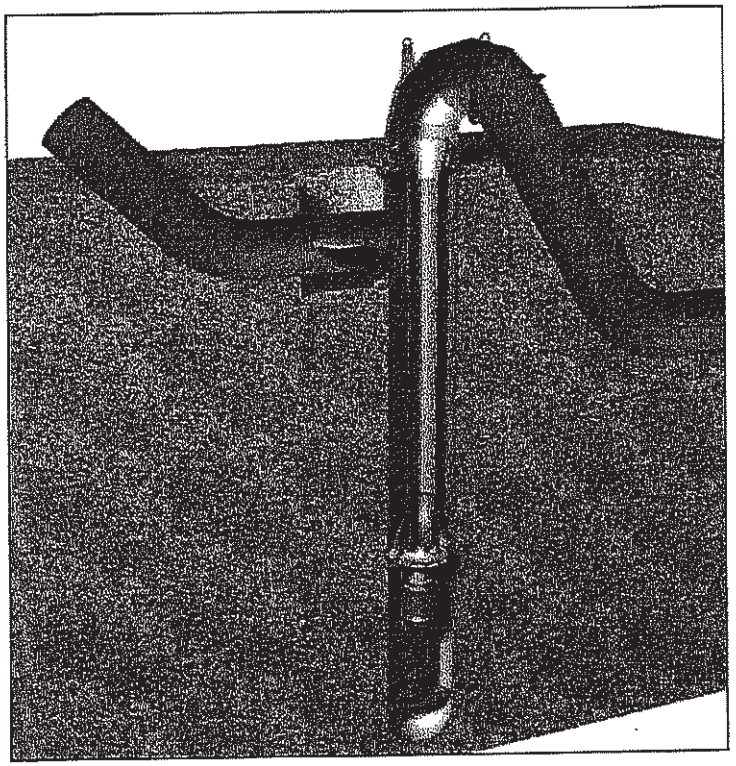
- Create new design criteria to define a new class of standard modular hydropower technology that will deploy at significantly reduced cost, with a smaller physical and environmental footprint
- Lower cost through **modularity**
- Ease of permitting from **standardization**
- **Considers stream functionality** that will increase the **likelihood of greater stakeholder acceptance** than conventional hydropower technology; potentially shortening the regulatory process



Example - Grid Reliability and Resilience: Development of Smaller, Modular, Lower-Cost Pumped Storage

Project Summary:

- Obermeyer Hydro Inc. will design a cost-effective, small-scale pumped storage system that incorporates reversible pump turbines with submersible permanent magnet motor generators installed in vertical shafts.
- Innovative pressure relief and hoisting systems eliminate the need for extensive underground excavation (single borehole), making the system more inexpensive than typical underground powerhouses.



Major Innovations and Strengths:

- Allows the turbine to be placed below tailwater level to avoid cavitation
- The scalability and versatility of the design will allow it to be used in a wide variety of sites in conjunction with reservoirs, mines, quarries, desalination plants and water supply systems

Example - Grid Reliability and Resilience: RADIANCE project, using existing hydro in new ways

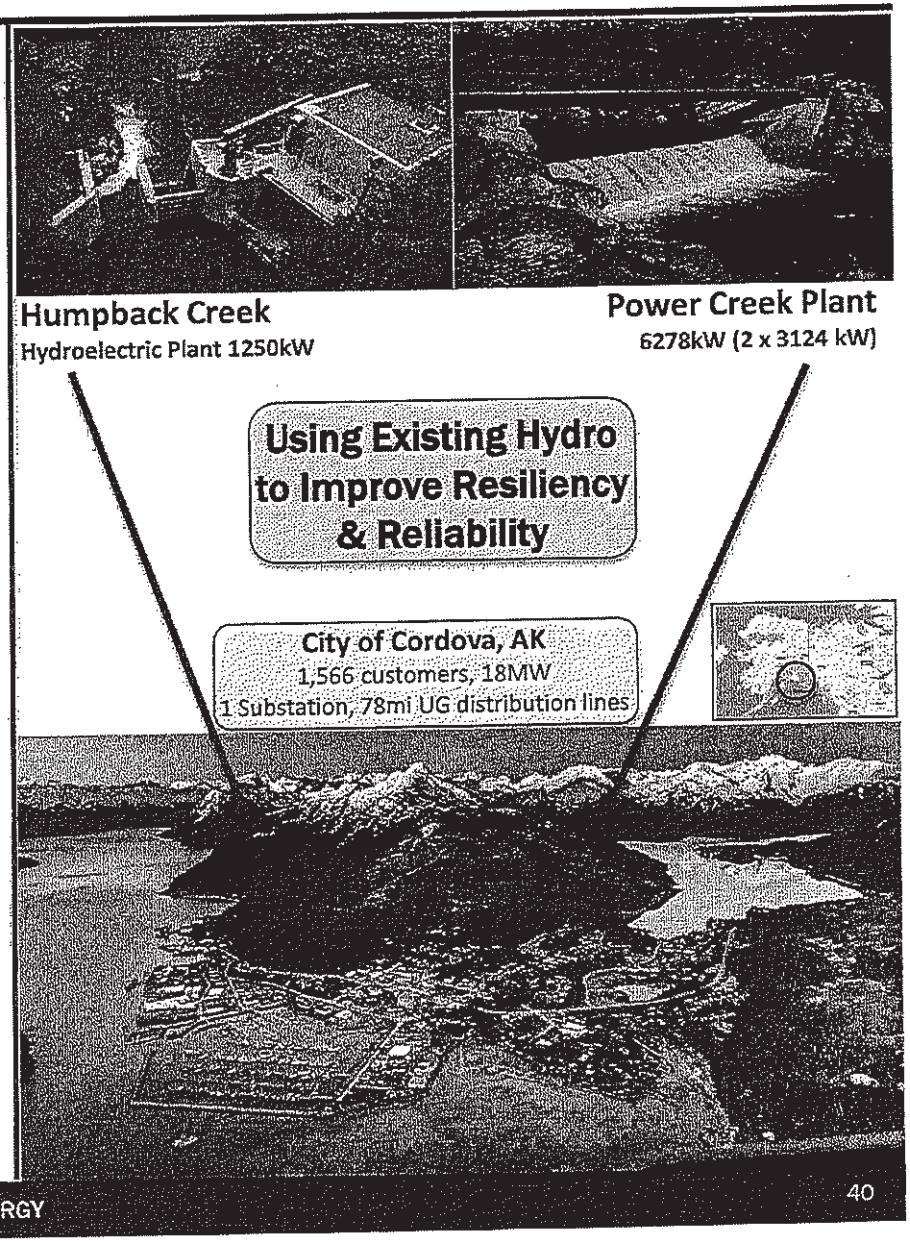
Self-Healing Microgrids to Help Keep Cordova, Alaska, Electrified

Idaho National Laboratory researchers assembled a coalition of partners to design a system of microgrids that would enhance grid resilience by maintaining and restoring power after a catastrophic event or a cyberattack.

During the coming months, the partners will demonstrate the integration of several technologies in the small fishing village of Cordova, Alaska.

When the microgrid system is finished, Cordova's electrical grid will automatically reroute power to ensure that critical public services — hospitals, emergency shelters and other vital services — have electricity if part of the grid is damaged or disabled.

When combined with next-generation grid sensors, **hydroelectric generation and storage**, battery storage and wind energy, Cordova's system of microgrids should remain partly functional even under extreme circumstances such as natural disasters or cyberattacks.

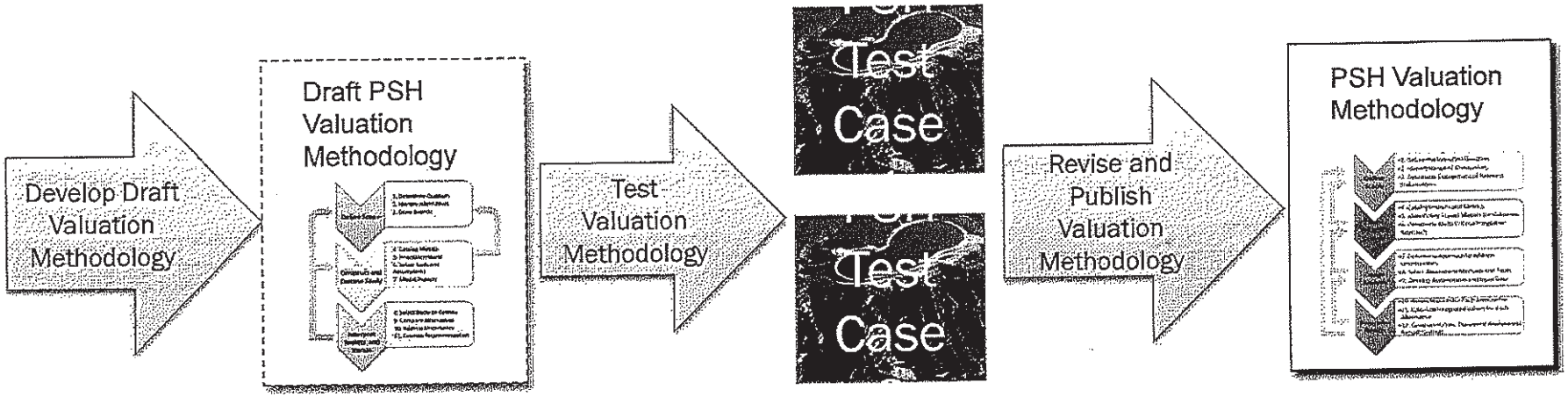


New Hydropower Valuation Research Initiative

- **Launch a new national research initiative in 2018 to understand and drive utilization of the full potential of hydroelectric resources to contribute to electric reliability and resiliency, now and into the future.**
- **Completed:**
  - New collaborative of hydropower national laboratories
  - Foundational multi-laboratory projects
  - RFI to solicit feedback on priorities and strategic direction
- **Coming shortly:**
  - Direct industry engagement and opportunities, including Water Power Week in DC

Foundational Initial Projects

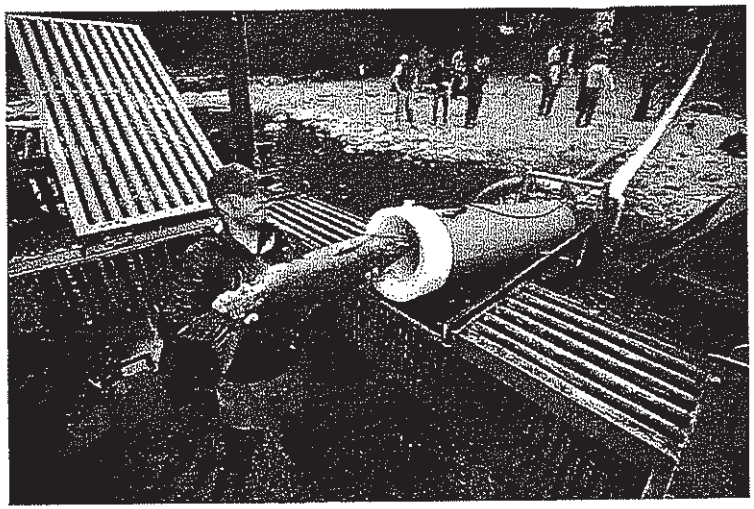
- Development of an advanced valuation methodology for pumped storage, tested through techno-economic analysis of pumped storage at two sites with high-levels of variable generation.



- Report on current operational landscape, research roadmaps for future grid scenarios and technology innovation

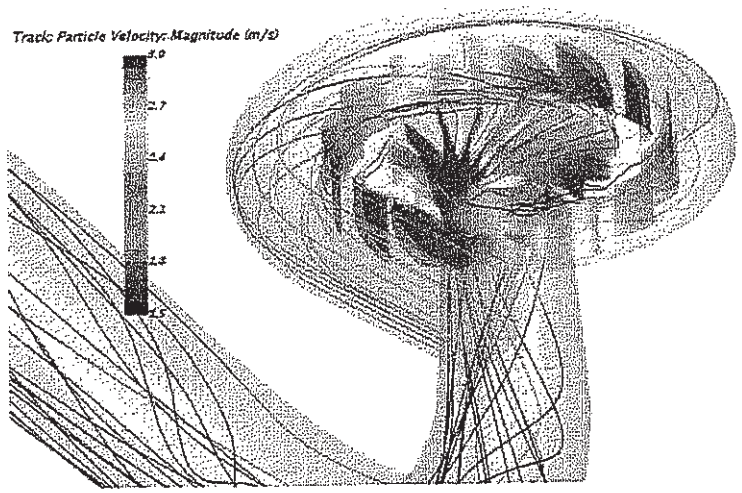
Examples - Environmental R&D and System Optimization: avoiding and reducing environmental impacts of hydropower

WHOOSHH Innovations Fish Transport System



- Novel solution to safely and rapidly transport fish over and around barriers
- Modular and quickly reconfigurable in order to provide options for a variety of dam designs and river systems
- Originally based on innovative technology from a non-energy industry

Biologically-Based Design and Evaluation (BioDE) Tools for Hydro Turbines



- New open-source computer-driven design tools to improve fish survival
- Maintains efficiency and generation for new turbines, reduce design and regulatory review time, and increases sustainable hydro development
- Already demonstrated in turbine procurement and evaluation processes by Grant County Public Utility District and USACE

Both reduce costs and potential delays in licensing

Example - Foundational and Crosscutting R&D: Design-Build-Test Competition Results in Technology Leap

DOE's Wave Energy Prize

- The Wave Energy Prize was an 18-month public design-build-test competition that catalyzed a technology leap in wave energy
- The winning team demonstrated a **five-fold improvement** in device efficiency and the potential for a cost-competitive industry
- 92 teams registered for the prize, and four teams exceeded DOE goal of doubling energy capture potential
- The Wave Energy Prize further developed a relationship between the DOE and the U.S. Navy
- Finalists tested devices at the Naval Surface Warfare Center's Maneuvering and Seakeeping Basin in Maryland.
- DOE received Challenge.gov Five Years of Excellence in Federal Challenge & Prize Competition Award for Best Public Engagement Strategy
- DOE received Federal Laboratory Consortium for Technology Transfer Mid-Atlantic Region Interagency Partnership Award



"We always liked our concept, of course, but then the competition and all the testing gave us the chance to learn so much and really advance our technology."

- Alex Hagmuller, team leader of grand-prize winner AquaHarmonics

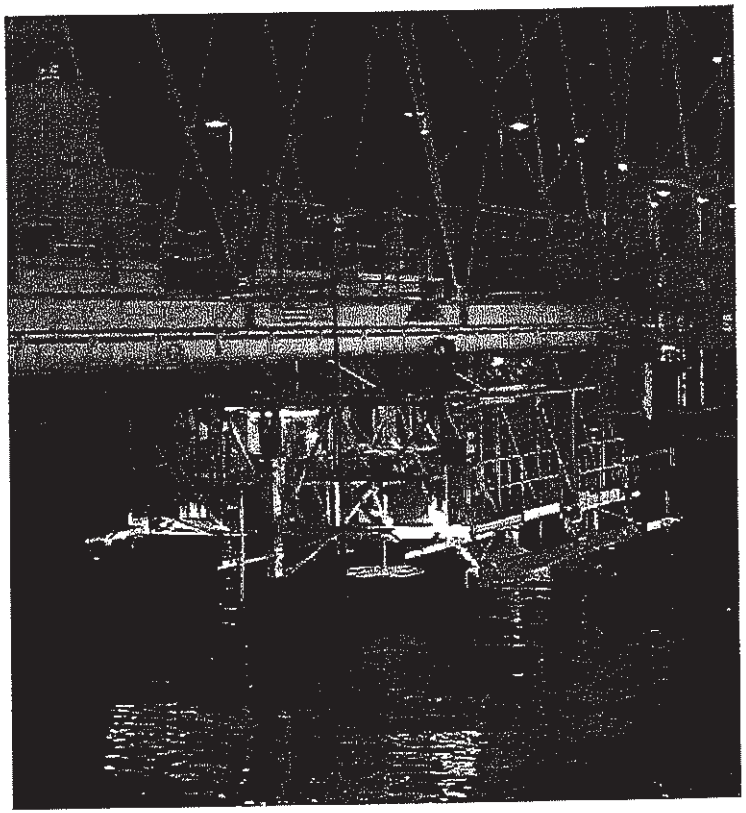
BACKGROUND

- Prize mechanism employed to jump start innovation in wave energy
- Overall goal was to make a step change in performance to get on track to achieve necessary cost reductions

Example - Foundational and Crosscutting R&D: Partnering with the Navy to Advance Controls for Wave Energy Converter Devices

Advanced Controls Research with Sandia National Laboratories and the U.S. Navy

- Existing wave energy device designs produce power efficiently over a narrow band of the full wave frequency spectrum
- Devices should produce power efficiently across a broad range of frequencies
- Advanced control strategies (i.e. how you clutch, brake, etc. with the device's generator), have shown very large increases in energy generation (up to double)
- Advanced controls will drive down LCOE
- Presently studying the control system of a 1-ton WEC using numerical modeling
- Develops tools to evaluate device-neutral control systems and test sensor-based algorithms
- Builds upon successes of DOE's Wave Energy Prize Competition



Researchers from Sandia National Laboratories coordinated with the U.S. Navy to test at the Maneuvering and Sea Keeping (MASK) basin at the Carderock, Maryland, naval base.

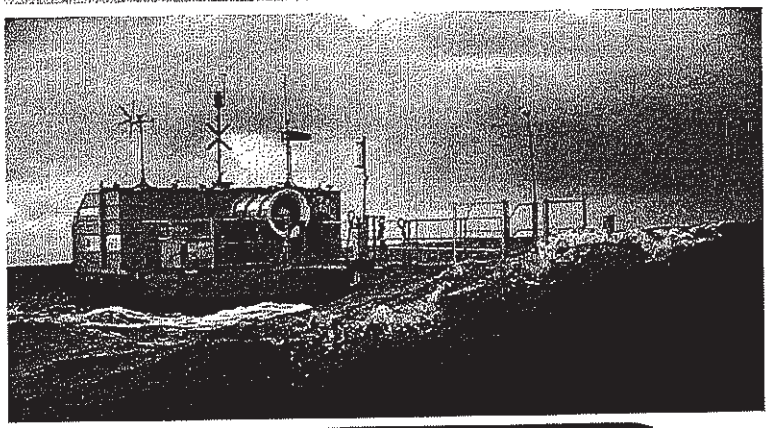
Example - Technology-specific System Design and Validation: Ocean Energy USA LLC

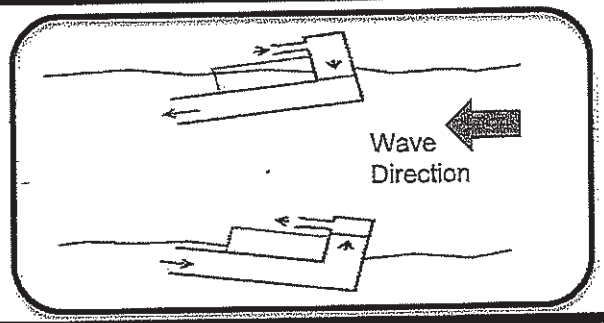
Testing of the Ocean Energy (OE) Buoy at U.S. Navy's Wave Energy Test Site in Hawaii

Project Summary: The oscillating water column device uses wave energy to pump air through a chamber that drives air turbine connected to an electrical generator. This project will leverage lessons learned from the previous three years of ¼ scale deployment in Galway Bay (Ireland) to target design improvements for a full scale deployment at WETS. The primary objectives are to validate sea-keeping performance, air-power performance, mooring design in open sea conditions, power output at full scale and critically, and to validate the LCOE incorporating annual energy production, availability, reliability, operations and maintenance costs and capital costs.

Major Partners	Rated Capacity	Technology Advanced
Dresser-Rand, NASSCO, General Dynamics, Tritec Naval Architects, NREL	500 kW	Oscillating Water Column

DOE Funding	Cost-Share	Total Project Cost
$5,000,000	$4,250,000	$9,250,000





Example - Reducing Barriers to Testing: Pacific Marine Energy Center, South Energy Test Site (PMEC-SETS)

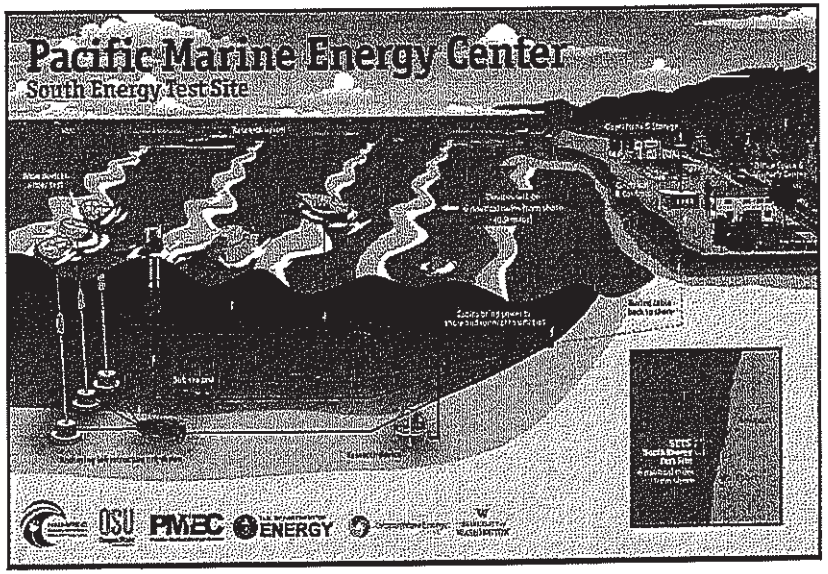
- Oregon State University-led team
- Co-located in Newport, Oregon, with Hatfield Marine Sciences Center
- Nearby availability of marine logistics and port facilities
- Will be fully permitted with a 25-year FERC hydroelectric license (draft license submitted to FERC in April, 2018) and grid connected
- High wave energy resources
- Four-berth test site, max of 20 WECs
- Total capacity: 20 MW
- Ability to test multiple arrays of wave energy devices simultaneously
- Construction to complete in 2020
- Strong community and state support
- Will position United States as a world leader in marine energy technologies

DOE Funding	Cost-Share	Total Project Cost
$40M	$27.5M	$67.5M

Partners

Core Team: 3U Technologies, European Marine Energy Centre, National Renewable Energy Laboratory, Pacific Energy Ventures, Sea Engineering

Technical Advisory Group: Aquatera, Ltd., Pacific Northwest National Laboratory, Sandia National Laboratories, SmartBay, University of Alaska Fairbanks, University of Washington, DOE, HINMREC



Example - Data Sharing and Analysis: Tethys Database

The premier resource for information on the potential environmental effects of marine energy.

Thousands of documents; searchable, sortable, tagged, with metadata.

Active dissemination tools: webinars, news feed, calendar of events, project metadata and information, links to external websites.



Rodriguez, Susan (CONTR)

From: Singsen, Jeannette
Sent: Monday, July 09, 2018 8:14 AM
To: Pezzullo, Leslie
Cc: Peralta, Kara Houston;Wozniak, Genevieve
Subject: RE: FY18 FOA
Attachments: FY18 FOA Status (7-9-2018) v2.xlsx

Hi Leslie – Quick update. I just talked to Shane in WETO and their collaborative FOA with AMO will now be a lab call. I updated the spreadsheet (attached). Now we're looking at:

- 29 FOAs/ALRDs total (planned + published)
- 4 FOAs approved by MA but not yet published
- 2 FOAs not yet briefed to EE-1

Jeannette
Phone: 240-562-1782

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 7:58 AM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>; Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>
Subject: RE: FY18 FOA

Thank you Jeannette.

This is exactly what we needed.

Best,
Leslie

From: Singsen, Jeannette
Sent: Monday, July 09, 2018 9:56 AM
To: Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>; Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>
Subject: RE: FY18 FOA

Hi Leslie,

Here you go. I added columns for Tech Office and Sector, in case you want to filter a particular way. Of note:

- 30 FOAs/ALRDs total (planned + published)
- 4 FOAs approved by MA but not yet published
- 3 FOAs not yet briefed to EE-1

Let me know if you need anything else!

Jeannette
Phone: 240-562-1782

From: Pezzullo, Leslie
Sent: Friday, July 06, 2018 3:35 PM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: FY18 FOA

Hi Jeannette,

Can you pull a list of all FOAs released in FY18 to date, and a list of all FY18 FOAs that haven't been posted yet. I believe this should be mostly available to you in the work plan and/or policy calendar.

Bindu didn't ask for a specific format, but I would think maybe a streamlined version of the work plan would work.

Is this something that you could provide by 12p ET Monday?

Leslie Pezzullo
Department of Energy
Office of Energy Efficiency and Renewable Energy
O: (202) 586-1514
C: (b) (6)

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-0001750	Flexible CHP Systems for Grid Support	$20,000,000	10	FY17	[redacted]

(b) (5)

AMO	TBD	Cybersecurity for Manufacturing	$10M	5 to 10	FY18	Not yet briefed to CC
AMO	TBD	Artificial Intelligence and Machine Learning in Materials Design	$10M	5 to 10	FY18	Not yet briefed to CC
BTO	DE-FOA-0001825	Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) - 2018	$19,500,000	14 to 24	FY18	[redacted]
BTO	DE-FOA-0001823	Solid-State Lighting Advanced Technology R&D – 2018	$15,000,000	10 to 16	FY18	[redacted]
BTO	DE-FOA-0001824	Building America Industry Partnerships and Research Priorities for High Performance Housing Innovation - 2018	$12,500,000	10 to 20	FY18	[redacted]
GMIP	DE-FOA-0001644	State Energy Program - Competitive Awards	$5,000,000	20	FY17	[redacted]
GMIP	WIP-GRD-2018	WAP Formula Awards	$247,500,000	56	FY18	[redacted]
GMIP	SEP-GRD-2018	State Energy Program Formula Grants	$30,000,000	56	FY18	[redacted]
GTO	DE-FOA-0001881	Efficient Drilling for Geothermal Energy (EDGE)	$14,500,000	8 to 10	FY18	[redacted]
GTO	DE-FOA-0001845	Zonal Isolation Technologies for Enhanced Geothermal Systems (EGS)	$4,450,000	4 to 10	FY18	[redacted]
GTO	TBD	Machine Learning for Geothermal Energy and Its Geosciences	$3,839,000	4 to 8	FY18	(b) (5)
SETO	DE-FOA-0001840	Solar Energy Technologies Office FY18 Funding Opportunity Announcement	$105,500,000	70	FY18	[redacted]
WETO	DE-FOA-0001727	U.S. Offshore Wind Research and Development Consortium FOA	$10,500,000	1	FY17	[redacted]
WETO	DE-FOA-0001824	Advanced Wind R&D to Reduce Costs and Improve Environmental Performance	$4,000,000	5 to 8	FY18	(b) (5)
WETO	DE-FOA-0001923	Offshore Wind Resource Science	$2,000,000	1	FY18	
WPTO	DE-FOA-0001837	Science and Hydrokinetic Technology Advancement and Data Dissemination	$22,200,000	Between 1 and 4	FY18	[redacted]
WPTO	DE-FOA-0001826	HydroDEC: Standard Modular Hydropower & Pumped Storage Hydropower	$13,000,000	5 to 10	FY18	(b) (5)
BETO	DE-FOA-0001936	Process Development for Advanced Biofuels and Bioproducts	$20,000,000	5 to 11	FY18	[redacted]
BETO	DE-FOA-0001917	Affordable and Sustainable Energy Crops (ASEC)	$15,000,000	3 to 6	FY18	[redacted]
BETO	DE-FOA-0001908	Efficient Carbon Dioxide in Algal Systems	$15,000,000	6 to 10	FY18	[redacted]
BETO	DE-FOA-0001926	BioEnergy Engineering for Precision Synthesis (BEEPS)	$28,000,000	14 to 25	FY18	[redacted]
FCTO	DE-FOA-0001874	Fuel Cell Technologies Office Annual FOA	$35,000,000	38	FY18	[redacted]
VTO	DE-SOA-0001822	Medium/Heavy-Duty, On-Road Natural Gas Engine R&D	$4,000,000	3	FY17	[redacted]
VTO	DE-FOA-0001825	Energy Efficiency R&D for Hard-Power Systems in Off-Road Vehicles	$4,500,000	3 to 4	FY17: $1M FY18: $3.5M	[redacted]
VTO	DE-FOA-0001828	FY 2017 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	$19,500,000	12	FY17: $10M FY18: $4.5M	[redacted]
VTO	DE-FOA-0001913	FY 18 Advanced Vehicle Technologies Research Funding Opportunity	$48,500,000	24 to 41	FY18	[redacted]

Rodriguez, Susan (CONTR)

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 8:17 AM
To: Singsen, Jeannette
Cc: Peralta, Kara Houston;Wozniak, Genevieve
Subject: RE: FY18 FOA

Ok, thx!

From: Singsen, Jeannette
Sent: Monday, July 09, 2018 11:14 AM
To: Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>; Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>
Subject: RE: FY18 FOA

Hi Leslie – Quick update. I just talked to Shane in WETO and their collaborative FOA with AMO will now be a lab call. I updated the spreadsheet (attached). Now we're looking at:

- 29 FOAs/ALRDs total (planned + published)
- 4 FOAs approved by MA but not yet published
- 2 FOAs not yet briefed to EE-1

Jeannette
Phone: 240-562-1782

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 7:58 AM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>; Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>
Subject: RE: FY18 FOA

Thank you Jeannette.

This is exactly what we needed.

Best,
Leslie

From: Singsen, Jeannette
Sent: Monday, July 09, 2018 9:56 AM
To: Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>; Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>
Subject: RE: FY18 FOA

Hi Leslie,

Here you go. I added columns for Tech Office and Sector, in case you want to filter a particular way. Of note:

- 30 FOAs/ALRDs total (planned + published)
- 4 FOAs approved by MA but not yet published

- 3 FOAs not yet briefed to EE-1

Let me know if you need anything else!

Jeannette
Phone: 240-562-1782

From: Pezzullo, Leslie
Sent: Friday, July 06, 2018 3:35 PM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: FY18 FOA

Hi Jeannette,

Can you pull a list of all FOAs released in FY18 to date, and a list of all FY18 FOAs that haven't been posted yet. I believe this should be mostly available to you in the work plan and/or policy calendar.

Bindu didn't ask for a specific format, but I would think maybe a streamlined version of the work plan would work.

Is this something that you could provide by 12p ET Monday?

Leslie Pezzullo
Department of Energy
Office of Energy Efficiency and Renewable Energy
O: (202) 586-1514
C: (b) (6)

Rodriguez, Susan (CONTR)

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 9:25 AM
To: Jacob, Bindu
Cc: Peralta, Kara Houston
Subject: FY18 FOAs
Attachments: FY18 FOAs (7-9-2018).xlsx

Bindu,

Jeannette was able to pull together a clean copy of the FOA Work Plan with the pertinent details on the full list of FY18 FOAs. For FY18, it looks like we have:

- 23 FOAs/ALRDs published
- 4 FOAs approved by MA but not yet published (estimated published dates are highlighted in orange)
- = 27 Total FOAs/ALRDs

In the attached, there are two additional potential FOAs listed for AMO (Cybersecurity and AI). AMO is waiting for the outcome of their recent lab call to determine whether or not they will be issuing FOAs on these two topics.

Best regards,
Leslie

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

Office	FOA #	FOA Name / Brief Description	$ Value (Estimated or Actual)	# Selections (Estimated or Actual)	Fiscal Year Funding	Date - FOA Release
AMO	TBD	Cybersecurity for Manufacturing	(b) (5)			
AMO	TBD	Artificial Intelligence and Machine Learning in Materials Design				

Rodriguez, Susan (CONTR)

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 2:03 PM
To: Singsen, Jeannette
Cc: Wozniak, Genevieve;Peralta, Kara Houston
Subject: FW: FY18 FOAs
Attachments: FY18 FOAs (7-9-2018).xlsx

Jeannette,

Just wanted to forward on the final result that was sent forward. Bindu asked that we change the note on the two *potential FOAs that AMO is still on the fence about.

Best,
Leslie

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 12:25 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: FY18 FOAs

Bindu,

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Best regards,
Leslie

Office	FOA #	FOA Name / Brief Description	$ Value (Estimated or Actual)	# Selections (Estimated or Actual)	Fiscal Year (Funding)	Note - Risk Indicator
AMO	DE-FOA-0002259	Flexible CHP Systems for Grid Support	$10,000,000	10	FY17	[redacted]

(b) (5)

AMO	TBD	Cybersecurity for Manufacturing	$20M	5 to 10	FY18	[redacted]
AMO	TBD	Artificial Intelligence and Machine Learning in Materials Design	$30M	5 to 10	FY18	[redacted]
BTO	DE-FOA-0001925	Building Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) - 2018	$19,500,000	14 to 24	FY18	[redacted]
BTO	DE-FOA-0001923	Solid-State Lighting Advanced Technology R&D - 2018	$23,000,000	10 to 15	FY18	[redacted]
BTO	DE-FOA-0001924	Building America Industry Partnerships and Research Priorities for Energy Performance Housing Innovation - 2018	$11,500,000	10 to 20	FY18	[redacted]
CSP	DE-FOA-0001549	Solar Energy Program - Competition Awards	$3,000,000	10	FY17	[redacted]
EWP	WAA-1118-2188	1602 Formula Awards	$2,47,500,000	56	FY18	[redacted]
EWP	SEP-0003-2018	State Energy Program Formula Grants	$38,000,000	56	FY18	[redacted]
GTO	DE-FOA-0001865	Efficient Drilling for Geothermal Energy (EDGE)	$20,000,000	8 to 10	FY18	[redacted]
GTO	DE-FOA-0001845	Small Pumpable Lightweight Wellbore Sealant Systems for Lost Circulation	$1,499,999	1 to 10	FY19	[redacted]
GTO	TBD	Analytics Roadmap for Geothermal Energy and the Geosciences	$3,000,000	4 to 8	FY18	[redacted]
SETO	DE-FOA-0002040	Solar Energy Technologies Office FY18 Funding Opportunity Announcement	$700,000,000	70	FY18	[redacted]
WETO	DE-FOA-0001787	U.S. Offshore Wind Research and Development Consortium FOA	$30,000,000	1	FY18	[redacted]
WETO	DE-FOA-0002034	Advanced Wind Plant Technologies Aimed at Improving Environmental Performance	$4,000,000	3 to 5	FY18	[redacted]
WETO	DE-FOA-0002023	Offshore Wind Resource Science	$4,000,000	1	FY18	[redacted]
WPTO	DE-FOA-0001637	Marine and Hydrokinetic Technology Advancement and Data Dissemination	$20,000,000	Between 1 and 4	FY18	[redacted]
WPTO	DE-FOA-0001836	Powering DOD Installations with Hydropower & Pumped Storage Hydropower	$10,000,000	5 to 10	FY18	[redacted]
BETO	DE-FOA-0001836	Process Development for Advanced Biofuels and Bioproducts	$50,000,000	5 to 15	FY18	[redacted]
BETO	DE-FOA-0001917	Algae Biomass Sustainability Consortium (ABSC)	$10,000,000	1 to 5	FY18	[redacted]
BETO	DE-FOA-0001908	Efficient Carbon Utilization in Algal Systems	$15,000,000	8 to 10	FY18	[redacted]
BETO	DE-FOA-0001884	Bioenergy Technology for Products Synthesis (ABCDS)	$30,000,000	14 to 25	FY18	[redacted]
FETO	DE-FOA-0001854	Fuel Cell Technologies Office Annual FOA	$30,000,000	18	FY18	[redacted]
VTO	DE-FOA-0001825	Medium/Heavy-Duty, On-Road Natural Gas Engine R&D	$4,000,000	2	FY19	[redacted]
VTO	DE-FOA-0001815	Energy Efficiency R&D for Hybrid-Power Systems in Off-Road Vehicles	$4,800,000	3 to 4	FY19: $3M FY20: $1.8M	[redacted]
VTO	DE-FOA-0001808	EV 2017 Topic 1a: Technologies to Enable Deep Reductions in Cost to Enable Extreme Fast Charging Fueling Opportunity Assessment	$18,500,000	12	FY17: $10M FY18: $4.5M	[redacted]
VTO	DE-FOA-0001810	FY18 Advanced Vehicle Technologies Research Funding Opportunity	$30,000,000	20 to 30	FY18	[redacted]

Rodriguez, Susan (CONTR)

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 5:42 PM
To: Singsen, Jeannette
Cc: Wozniak, Genevieve;Peralta, Kara Houston
Subject: RE: FY18 FOAs
Attachments: FY18 FOAs (7-9-2018).xlsx

Jeannette,

Ok, we made some more changes and noticed that there were two FOAs listed as posted that actually haven't yet been posted (unless I'm missing them online). The two were the Wind FOA that we pulled (Advanced Wind R&D to Reduce Costs and Improve Environmental Performance) and the WETO Offshore Wind Resource Science FOA scheduled for release in August.

Best,
Leslie

From: Pezzullo, Leslie
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To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>; Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: FW: FY18 FOAs

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Best regards,
Leslie

Office	FOA #	FOA Name / Brief Description	$ Value (Estimated or Actual)	# Selections (Estimated or Actual)	Fiscal Year Planning	Status / FOA Process
AMO	DE-FOA-0002149	Photonic Chip Systems for Data Centers	$10,000,000	12	FY17	

(b) (5)

BTO	DE-FOA-0002173	Building Energy Efficiency Frontiers & Innovation Technology (BENEFIT) - 2018	$30,000,000	10 to 20	FY18	
BTO	DE-FOA-0002021	Solid-State Lighting Advanced Technology R&D - 2018	$15,000,000	10 to 15	FY18	
BTO	DE-FOA-0002178	Building Materials Industry Partnerships and Research Projects for High Performance Building Envelopes - 2018	$20,000,000	10 to 20	FY18	
CMTO	DE-FOA-0002144	Clean Energy Technology - Competitive Awards	$3,000,000	20	FY17	
CMTO	Hybrid-eGRID-2018	Hybrid Power Generation	$247,000,000	25	FY18	
DMTO	SETP-WPTO-2018	State Energy Policy Technical Assistance Grants	$20,000,000	50	FY18	
GTO	DE-FOA-0002016	Efficient Drilling for Geothermal Energy (EDGE)	$4,000,000	8 to 10	FY18	
GTO	DE-FOA-0002135	Tools to Accelerate Adoption of Low-Cost Enhanced Geothermal Systems (ETA)	$4,000,000	4 to 10	FY18	
HFTO	TBD	Machine Learning for Geothermal Energy and the Grid Interface	$1,000,000	4 to 8	FY18	
SETO	DE-FOA-0002019	Solar Energy Technologies Office FY18 Funding Opportunity Announcement	$205,000,000	75	FY18	
WETO	DE-FOA-0002167	U.S. Offshore Wind Research and Development (R&D) Consortium FOA	$20,000,000	1	FY18	
WETO	DE-FOA-0002134	Advanced Wind Plant Research and Development for Reduced Costs and Increased Environmental Performance	$6,000,000	3 to 4	FY18	
WETO	DE-FOA-0002183	Offshore Wind Resource Science	$4,000,000	1	FY18	
WPTO	DE-FOA-0002172	Hydropower and Hydrokinetic Technology Advancements and Data Dissemination	$20,000,000	Between 1 and 4	FY18	
WPTO	DE-FOA-0002156	HydroWIRE: Blueprint Models for Hydropower & Pumped Storage Hydropower	$12,000,000	5 to 15	FY18	
BETO	DE-FOA-0002149	Process Development for Advanced Biofuels and Bioproducts	$20,000,000	5 to 15	FY18	
BETO	DE-FOA-0002177	Algae Biofuels and Bioproducts Feedstock Development (ABPDF)	$15,000,000	3 to 6	FY18	
BETO	DE-FOA-0002208	Integrated Biorefinery Operations (IBO)	$13,000,000	0 to 10	FY18	
BETO	DE-FOA-0002015	Feedstock Technologies for Biofuels and Bioproducts (FEEDS)	$20,000,000	10 to 20	FY18	
FCTO	DE-FOA-0002152	Fuel Cell Technologies Office Annual FOA	$30,000,000	15	FY18	
VTO	DE-FOA-0002112	Advanced Engine, Fuels, and Emission Control Technologies R&D	$4,000,000	3	FY17	
VTO	DE-FOA-0002175	Energy Efficiency R&D for Electrification in Off-Road Vehicles	$4,000,000	3 to 4	FY18: $2M FY19: $1.5M	
WBS	DE-FOA-0002189	FY 2017 Vehicle Technologies Office Areas other than Electrification Battery Technologies Fuel Cell Technologies Advanced Vehicle Testing Activity and Vehicle Systems	$12,000,000	10	FY17: $10M FY18: $2M	
VTO	DE-FOA-0002138	FY 18 Advanced Vehicle Technologies Research Funding Opportunity	$48,000,000	20 to 25	FY18	

Key	
	Action Completed
	Action in Next 30 Days
	Action in Next 30-90 Days
*	FY18 Actions

Rodriguez, Susan (CONTR)

From: Singsen, Jeannette
Sent: Tuesday, July 10, 2018 7:31 AM
To: Pezzullo, Leslie
Subject: RE: FY18 FOAs
Attachments: FY18 FOAs (7-10-2018).xlsx

No, you're right. We backed into the "published" number from the MA numbers instead of looking at the dates. Sorry about that!

Also, speaking of updates, do you want to update any of the following on your spreadsheet or should I update the Work Plan to match your dates? I highlighted these questions in yellow on the attached version.

1. FOA # 4: (b) (5)
2. FOA # 10: (b) (5)
3. FOA # 11: (b) (5)
4. FOA # 15: (b) (5)

   so

   maybe it doesn't matter, just thought I'd bring it up.
5. FOA # 17: (b) (5)
6. FOA # 18: (b) (5)

   Should I update the Work Plan?
7. FOA # 24 & 25: (b) (5)
8. FOA # 26:(b) (5)

Jeannette Singsen
Phone: 240-562-1782

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 6:42 PM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>; Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: RE: FY18 FOAs

Jeannette,

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Best regards,
Leslie

Office	FOA #	FOA Name / Brief Description	$ Dollar Size - Actual	# Awards - Anticipated or Actual	Fiscal Year Funding	Est. Approval Date	Comments
AMO	DE-FOA-0002206	Flexible CHP Systems for Smart Grid Support	$10,000,000	10	FY17	10/13/2017	

(b) (5)

BTO	DE-FOA-0001843	Building Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) - 2018	$16,500,000	10 to 14	FY18	4/18/2018	
BTO	DE-FOA-0001852	Solid-State Lighting Advanced Technology (SSLT) – 2018	$15,000,000	10 to 15	FY18	4/18/2018	
BTO	DE-FOA-0001824	Building America Industry Partnerships and Research Priorities for High Performance Housing Construction - 2018	$12,500,000	10 to 20	FY18	5/4/2018	
CMTA	DE-FOA-0001764	State Energy Program - Competitive Awards	$3,000,000	10	FY17	Q4 of FY17	
CMTA	EERE-SEP-2018	SEP Formula Awards	$247,500,000	56	FY18	10/01/2017	
CMTA	SEP-WAP-2018	State Energy Program Formula Grants	$70,000,000	56	FY18	11/30/2017	
GTO	DE-FOA-0001847	Small Scale Building and Infrastructure Energy Solutions	$14,000,000	9 to 20	FY18	4/18/2018	
GTO	DE-FOA-0001841	SmartLabs: Laboratory Scale Testing for Integrated Geothermal Systems (GIES)	$4,450,000	4 to 10	FY18	5/30/2018	
GTO	TBD	Advanced Leasing for Geothermal Energy and the Environment	$14,000,000	4 to 8	FY18	5/4/2018	(b) (5)
SETO	DE-FOA-0001845	Solar Energy Technologies Office FY18 Funding Opportunity Announcement	$315,000,000	20	FY18	1/30/2018	
WETO	DE-FOA-0001767	U.S. - DOE Joint Wind Research and Development Consortium FOA	$20,000,000	1	FY18	Q3 of FY18	(b) (5)
WETO	DE-FOA-0001854	Advanced Wind O&M Technologies Cross-cutting Improvements Development Performance	$6,000,000	6 to 8	FY18	5/4/2018	
WETO	DE-FOA-0001833	Offshore Wind Consortium	$8,000,000	1	FY18	5/4/2018	
WPTO	DE-FOA-0001837	Marine and Hydrokinetic Technology Assessment FOA (Early Stage Marine Energy)	$20,000,000	Between 2 and 5	FY18	3/14/2018	(b) (5)
WPTO	DE-FOA-0001838	Hydropower Incremental Generation & Pumped Storage Improvement	$12,000,000	5 to 10	FY18	3/14/2018	
BETO	DE-FOA-0001836	Process Development for Advanced Biofuels and Bioproducts	$40,000,000	5 to 12	FY18	4/18/2018	
BETO	DE-FOA-0001842	Advanced Algae Biomass Energy Consortium	$15,000,000	3 to 6	FY18	4/18/2018	
SETO	DE-FOA-0001837	Efficient Gesture Withdrawn in Alert Systems	$10,000,000	4 to 10	FY18	4/18/2018	
BETO	DE-FOA-0001840	Bioenergy Engineering for Products Synthesis (BEPS)	$20,000,000	8 to 20	FY18	4/18/2018	
SETO	DE-FOA-0001834	Assessment Technology Office Annual FOA	$20,000,000	20	FY18	3/8/2018	
WPTO	DE-FOA-0001831	Advanced Hydropower Pre-Build Modeling Tools Engineering Design	$4,000,000	3	FY17	3/25/2017	
WPTO	DE-FOA-0001832	Energy Efficiency R&D for Fluid Power Systems in Off-Road Vehicles	$4,000,000	3 to 4	FY17: $1M FY18: $1.5M	9/28/2017	
WPTO	DE-FOA-0001830	FY 2017 Vehicle Technologies Office: Batteries and Electrification Technologies Subtopic Area Charging Ecosystem Technologies	$20,000,000	12	FY17: $15M FY18: $4.5M	Q4 of FY17	
WPTO	DE-FOA-0001823	FY 17 Advanced Vehicle Technology Research Funding Opportunity	$40,500,000	30 to 50	FY18	4/18/2018	

Color Key	Key
	Action to Start 30 Days
	Action to Start 31-60 Days
	Action to Start 61-90 Days
	Wrap Awards

Rodriguez, Susan (CONTR)

From: Pezzullo, Leslie
Sent: Tuesday, July 10, 2018 4:00 PM
To: Singsen, Jeannette
Subject: RE: FY18 FOAs

No, not on FY18.

Do you have a few minutes tomorrow to talk about how you track these FOAs? I know that Alex liked the color coding associated to both the proposed release date of the FOA and the selections announcement.

Best,
Leslie

From: Singsen, Jeannette
Sent: Tuesday, July 10, 2018 1:15 PM
To: Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Subject: RE: FY18 FOAs

Thank you! I will add the links to the Work Plan.

Do you need anything else from me on the FY18 FOA spreadsheet project?

Jeannette Singsen
Phone: 240-562-1782

From: Pezzullo, Leslie
Sent: Tuesday, July 10, 2018 8:38 AM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Subject: RE: FY18 FOAs

Thanks Jeannette.

I've made individual notes below on these items based on your questions and the though process last night. Bindu would like to include the links in the work plan moving forward.

Also, I removed the two AMO items from this document, but they should both be listed as POTENTIAL FOAS when we are reporting status of upcoming FOAs to Bindu/Alex. AMO has not confirmed whether or not a FOA would be the correct mechanism.

Best;
Leslie

From: Singsen, Jeannette
Sent: Tuesday, July 10, 2018 10:31 AM
To: Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>
Subject: RE: FY18 FOAs

No, you're right. We backed into the "published" number from the MA numbers instead of looking at the dates. Sorry about that!

Also, speaking of updates, do you want to update any of the following on your spreadsheet or should I update the Work Plan to match your dates? I highlighted these questions in yellow on the attached version.

1. FOA # 4: (b) (5)

2. FOA # 10: (b) (5)

3. FOA # 11: (b) (5)

4. FOA # 15: (b) (5)

   so

   maybe it doesn't matter, just thought I'd bring it up. (b) (5)

5. FOA # 17: (b) (5)

6. FOA # 18: (b) (5)

   Should I update the Work Plan? You can update the FY18 FOA spreadsheet with this.

7. FOA # 24 & 25: (b) (5)

   You can update the FY18 FOA spreadsheet with this.

8. FOA # 26: (b) (5)

   You can update the FY18 FOA spreadsheet with this.

Jeannette Singsen
Phone: 240-562-1782

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 6:42 PM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>; Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: RE: FY18 FOAs

Jeannette,

Ok, we made some more changes and noticed that there were two FOAs listed as posted that actually haven't yet been posted (unless I'm missing them online). The two were the Wind FOA that we pulled (Advanced Wind R&D to Reduce Costs and Improve Environmental Performance) and the WETO Offshore Wind Resource Science FOA scheduled for release in August.

Best,
Leslie

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 5:03 PM
To: Singsen, Jeannette <Jeannette.Singsen@EE.Doe.Gov>
Cc: Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>; Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: FW: FY18 FOAs

Jeannette,

Just wanted to forward on the final result that was sent forward. Bindu asked that we change the note on the two *potential FOAs that AMO is still on the fence about.

Best,
Leslie

From: Pezzullo, Leslie
Sent: Monday, July 09, 2018 12:25 PM
To: Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Cc: Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>
Subject: FY18 FOAs

Bindu,

Jeannette was able to pull together a clean copy of the FOA Work Plan with the pertinent details on the full list of FY18 FOAs. For FY18, it looks like we have:

- 21 FOAs/ALRDs published
- 6 FOAs approved by MA but not yet published (estimated published dates are highlighted in orange)
- = 27 Total FOAs/ALRDs

In the attached, there are two additional potential FOAs listed for AMO (Cybersecurity and AI). AMO is waiting for the outcome of their recent lab call to determine whether or not they will be issuing FOAs on these two topics.

Best regards,
Leslie

Rodriguez, Susan (CONTR)

From: Pezzullo, Leslie
Sent: Wednesday, July 11, 2018 6:32 AM
To: Dasher, Natasha (CONTR)
Subject: Program Policy Factor Matrix
Attachments: FY18 FOAs (7-9-2018).xlsx; GTO - DRAFT - Machine Learning FOA (FOA 1956).docx; WETO - Advanced Wind R&D FOA (FOA 1924).docx

Hi Natasha,

Per the conversation yesterday in Bindu's office, can you pull out the list of the standard program policy factors (PPFs) out of the FOA template (on i2) and then develop a matrix to determine which of the PPFs were included in each of the FOAs in the FY18 FOA list. (b) (5)

The FY18 FOA list includes both FOAs that have been published and those still in development. For those that have been published, there is a link in the spreadsheet to the FOA online. There are two more drafts FOAs attached that should be incorporated into the analysis, and the others should just be included at the bottom of the matrix to be entered when we have drafts of the FOAs.

The information in the attached draft FOAs is sensitive so please do not distribute further.

Please let me know if you have any questions.

Best,
Leslie

Leslie Pezzullo
Department of Energy
Office of Energy Efficiency and Renewable Energy
O: (202) 586-1514
C: (b) (6)

Office	FOA #	FOA Name / Brief Description	Budget (Estimated or Actual)	# Projects (Estimated or Actual)	Timeframe Pending	Date FOA Published
AMO	DE-FOA-0001920	Flexible CHP Systems for DoD Support	$1,000,000	10	FY17	

(b) (5)

BTO	DE-FOA-0001825	Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) - 2018	$19,500,000	14 to 24	FY18	
BTO	DE-FOA-0001847	Solid State Lighting Advanced Development R&D – 2018	$15,000,000	10 to 16	FY18	
BTO	DE-FOA-0001923	Building Energy Efficiency Technologies and Practices for 2018 FY19-20 Incubator FOA (Energy Innovation) – 2018	$13,500,000	10 to 20	FY18	
CMO	DE-FOA-0001934	State Energy Programs - Competitive Awards	$5,000,000	50	FY17	
CMO	WAP-ALNO-2018	WAP Formula Awards	$247.5 M/year	56	FY18	
CMO	SEP-ALNO-2018	State Energy Program Formula Grants	$29,000,000	56	FY18	
CTO	DE-FOA-0001958	Efficient Building Envelope and Energy Efficient Components	$14,500,000	8 to 10	FY18	
CTO	DE-FOA-0002037	Rapid Installer Methodologies for Cost and Quantified Solar PV (RIMS)	$4,450,000	4 to 10	FY19	
CTO	TBD	Machine Learning for Geothermal Energy and Grid Applications	$3,625,000	4 to 5	FY18	(b) (5)
SETO	DE-FOA-0001660	Solar Energy Technologies Office (FY18 Funding Opportunity Announcement)	$105,500,000	75	FY18	
WETO	DE-FOA-0001732	U.S. Offshore Wind Research and Development Consortium FOA	$20,000,000	3	FY18	
WETO	DE-FOA-0001834	Advanced Water and Power Technology Concepts and Improved Components for Hydropower	$6,000,000	4 to 8	FY18	(b) (5)
WETO	DE-FOA-0001919	Offshore Wind Resource Science	$8,000,000	1	FY18	
WPTO	DE-FOA-0001837	Water and Wastewater Treatment Technologies Advancement and Data Dissemination	$10,000,000	Between 1 and 4	FY18	
WPTO	DE-FOA-0001836	Hydropower Advancement Opportunities for Low-Impact, Environmentally Sustainable Domestic Hydropower Development	$12,000,000	5 to 10	FY18	(b) (5)
BETO	DE-FOA-0001870	Process Development for Advanced Biofuels and Bioproducts	$20,000,000	5 to 15	FY18	
BETO	DE-FOA-0001912	Algae Farms and Supporting Technologies (AFST)	$3,000,000	3 to 5	FY18	
SETO	DE-FOA-0001908	Efficient Carbon Utilization in Algal Systems	$15,000,000	8 to 10	FY18	
BETO	DE-FOA-0001838	Biochemical Engineering for Synthetic Chemicals (BioSTEPS)	$10,000,000	3 to 10	FY18	
FCTO	DE-FOA-0001874	Fuel Cell Technologies Office Annual FOA	$20,000,000	25	FY18	
VTO	DE-FOA-0001911	Medium/Heavy-Duty Diesel-Natural Gas Engine R&D	$4,000,000	3	FY17	
VTO	DE-FOA-0001835	Energy Efficiency R&D for Fluid-Powered Systems in Off-Road Vehicles	$4,000,000	3 to 4	FY18: $2M FY19: $1.5M	
VTO	DE-FOA-0001839	FY 2019 Vehicle Technologies Office Batteries and Electrification to Enable Extreme Fast Charging Funding Opportunity Announcement	$19,500,000	12	FY18: $15M FY19: $4.5M	
VTO	DE-FOA-0002033	FY 19 AdvancedV ehicle Technologies Research Funding Opportunity	$64,500,000	30 to 33	FY19	

Key
Action Completed
Action in Next 30 Days
Action in Next 31-90 Days
FY19 Action

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]: Please include my team on the email address box to have "Read/Write" access. Myself, Dave, and Mary Murray

Table of Contents

Commented [TEM3]: 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.

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Questions about this FOA? Email machinelearningeo@ee.doe.gov
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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)

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

Commented [TEM6]: (b) (5)

Commented [M37]: This looks good (b) (5)

Topic 1: Machine Learning for Geothermal Exploration

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.

Commented [WG8] (b) (5)

Commented [WG9]: I think we should change "Phases" to "Budget Periods" to align with our award documents.

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

Commented [WM10]: (b) (5) (b) (5)

Commented [WG11R10]: (b) (5) (b) (5)

Commented [WG12]: (b) (5) (b) (5)

Commented [WG13]: (b) (5)

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,

Commented [WG14]: (b) (5)

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

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

Commented [MJ15]: (b) (5)

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

Commented [WG16]: (b) (5)
(b) (5)

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

Commented [TB17]: Consult with Legal Counsel to determine the statutory authorization, the legal citation and any additional background on the programmatic authority (e.g., where there are multiple authorities) as necessary.

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.

Commented [TEM18]: Delete if FOA does not include topic areas.

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.

Commented [TEM19]: Delete if FOA does not include topic areas.

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

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.

III. Eligibility Information

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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

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

1. 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	4 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

(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 choose the page maximum for their FOA. Note that the Technical Volume's 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:
  - The roles and the work to be performed by each PI and Key Participant;
  - Business agreements between the applicant and each PI and Key Participant;
  - How the various efforts will be integrated and managed;
  - Process for making decisions on scientific/technical direction;
  - Publication arrangements;
  - Intellectual Property issues; and
  - 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".

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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".

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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Commented [MJ38]: Concur.

xv. Additional Requirements

Commented [TEM39]: This is placeholder text. List any additional file attachments here, if applicable. When requesting additional file attachments, be sure to update the tables above appropriately, and follow the formatting style. If there are no additional requirements to be placed here, delete the placeholder text.

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 compiled with all applicable DUNS and SAM requirements and, if an applicant has not fully compiled 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

Commented [TEM42]: Consult with Legal to select the option that is most applicable to your FOA, and delete the rest. If no options are applicable, delete them all and insert custom text. Consult with Legal Counsel and the Contracting Officer before inserting custom text.

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

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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;

- 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.

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(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.

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.

Criterion 3: Team and Resources (20%)

Commented [MJ46]: If you decide to add a subcriterion re access to datasets, this may be a good spot for it.

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.

- 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

1. 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.

- 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 [M152]: 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

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:

Commented [WG56]: (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

Commented [WG58](b) (5)

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.

Commented [WG59]: Please complete

Commented [WG60]: Budget period

Commented [TEM61]: If you do anticipate doing a post-selection down select, you must include this section. Otherwise, delete it.

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

Commented [MJ64]: Concur.

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.

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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

	Data Management Plan	ControlNumber_LeadOrganization_DMP

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:
    - The overall approach to and organization for managing the work
    - The roles of each Project Team member
    - Any critical handoffs/interdependencies among Project Team members
    - The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices
    - The approach to project risk management
    - A description of how project changes will be handled
    - If applicable, the approach to Quality Assurance/Control
    - How communications will be maintained among Project Team members

- Market Transformation Plan: The applicant should provide a market transformation plan, including the following:
    - 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

	○ 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 ROC) 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.

Rodriguez, Susan (CONTR)

Sent: Thursday, July 12, 2018 9:19 AM
To: Fricker, Kyle
Subject: RE: FY18 FOA approvals

Thanks, Kyle! It has been difficult to get all teams to use the same format previously (even in the lab call, so let me know if you need help)

-----Original Message-----
From: Fricker, Kyle
Sent: Thursday, July 12, 2018 11:50 AM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: RE: FY18 FOA approvals

Becca, I can make sure all the waterfalls are in the same format and include the merit review criteria in that memo.

-Kyle

-----Original Message-----
From: Jones-Albertus, Becca
Sent: Thursday, July 12, 2018 10:20 AM
To: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: FY18 FOA approvals

Hi team,

Ebony just let me know that there is a new briefing process for FOAs for our Acting EE-1 Cathy Tripodi. (b) (5)

She does not want powerpoint decks, but rather a 1-2 page document. She is especially interested in the evaluation criteria used to make selections and who our past awardees have been compared to these awardees (b) (5)

We should strategize on how to get the briefing for Acting EE-1 into our extremely tight schedule, (b) (5)

Becca

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Thursday, July 12, 2018 9:21 AM
To: Fricker, Kyle
Subject: RE: FY18 FOA approvals

Thanks, Kyle! It has been difficult to get all teams to use the same format previously (even in the lab call), so please let me know if you need help in the herding process. (b) (5)

:)

Becca

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From: Fricker, Kyle
Sent: Thursday, July 12, 2018 11:50 AM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: RE: FY18 FOA approvals

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From: Jones-Albertus, Becca
Sent: Thursday, July 12, 2018 10:20 AM
To: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: FY18 FOA approvals

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Becca

Rodriguez, Susan (CONTR)

From: Vauss, Ebony
Sent: Thursday, July 12, 2018 8:46 PM
To: Jones-Albertus, Becca;Fricker, Kyle;DL-EERE-4S PMsolar
Cc: Kane, Victor;Murley, Susanna (CONTR)
Subject: RE: FY18 FOA approvals

(b) (5)

Best,

Ebony, Solar Office
(202) 586-9879
(b) (6)

-----Original Message-----
From: Jones-Albertus, Becca
Sent: Thursday, July 12, 2018 10:20 AM
To: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: FY18 FOA approvals

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Becca

Rodriguez, Susan (CONTR)

From: Vauss, Ebony
Sent: Thursday, July 19, 2018 7:35 AM
To: Murley, Susanna (CONTR);Jones-Albertus, Becca;Fricker, Kyle;DL-EERE-4S PMsolar
Cc: Kane, Victor
Subject: RE: FY18 FOA approvals

Location, name, FOA name, award amount. (b) (5) We can discuss more at our tag up.

Best,

Ebony, Solar Office
(202) 586-9879
(b) (6)

-----Original Message-----
From: Murley, Susanna (CONTR)
Sent: Thursday, July 19, 2018 10:10 AM
To: Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>
Subject: RE: FY18 FOA approvals

What data would they want on each awardee? Is there a template or can we choose what to include?

Susanna Murley
Strategic Management Team Lead
The Building People, LLC | U.S. Department of Energy
Contractor supporting the Solar Energy Technologies Office
Office of Energy Efficiency and Renewable Energy
Office: 202.287.1637 | Cell: (b) (6)

-----Original Message-----
From: Vauss, Ebony
Sent: Thursday, July 12, 2018 11:48 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: RE: FY18 FOA approvals

*by awardee not buy.

Best,

Ebony, Solar Office
(202) 586-9879
(b) (6)

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Monday, July 23, 2018 10:32 AM
To: Unruh, Timothy;Gay, Charlie
Cc: Garson, Jennifer
Subject: RE: SETO FOA Selections

Hi Tim,

Our team worked closely with Gil Bindewald (OE) on the subtopics and specific language of topic 1 of the FOA. We have asked for their involvement in the review process but so far they have said they are too busy. We will be asking them to be part of our Federal Consensus Panel that recommends the selections for the FOA, as well. That panel meets in late August.

Becca

From: Unruh, Timothy
Sent: Monday, July 23, 2018 1:26 PM
To: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Cc: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Garson, Jennifer <Jennifer.Garson@EE.doe.gov>
Subject: SETO FOA Selections

Can you let me know what coordination was done with OE on topic 1 for the creation of topic 1, as well as any coordination with OE on the selections?
thx

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

Rodriguez, Susan (CONTR)

From: Yuan, Guohui
Sent: Monday, July 23, 2018 1:09 PM
To: Jones-Albertus, Becca
Subject: FW: revised SETO FY18 FOA SI topics

From: Yuan, Guohui
Sent: Thursday, March 01, 2018 12:22 PM
To: Bindewald III, Gilbert <Gilbert.Bindewald@hq.doe.gov>
Cc: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: RE: revised SETO FY18 FOA SI topics

Please look at this version.

I noticed that I missed one of your comments so I tweaked the following sentence

"Since large investments in the past and today in the nation's electric grid infrastructure will remain in service for decades, it is important that the U.S. make smart decisions to invest in enabling and forward-looking technologies that will support the creation of a modern grid infrastructure in the coming years."



From: Yuan, Guohui
Sent: Thursday, March 01, 2018 12:13 PM
To: Bindewald III, Gilbert <Gilbert.Bindewald@hq.doe.gov>
Cc: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: revised SETO FY18 FOA SI topics

Hello Gil,

Thank you so much for the feedbacks and your support throughout this effort. I have incorporated your latest comments in the revised FOA document (attached).

<< File: SETO FOA SI topics - revised March01-2018.docx >>
As I mentioned, we plan to release the FOA as soon as we have an approved budget from Congress. That means we need to lock down the document fairly soon to get everything ready and march on. I hope we have addressed the issues/concerns raised by OE.

Guohui

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Monday, July 23, 2018 1:28 PM
To: Yuan, Guohui
Subject: RE: revised SETO FY18 FOA SI topics

Thanks.

From: Yuan, Guohui
Sent: Monday, July 23, 2018 4:26 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Subject: RE: revised SETO FY18 FOA SI topics

No, I was not.
Michael was on the email thread that I forwarded you. He didn't make any comments.

From: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Date: Monday, Jul 23, 2018, 4:14 PM
To: Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Subject: RE: revised SETO FY18 FOA SI topics

Thanks! Were you cc'ed on the email that Gil sent to Katie and Michael?

From: Yuan, Guohui
Sent: Monday, July 23, 2018 4:04 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Subject: FW: revised SETO FY18 FOA SI topics

From: Bindewald III, Gilbert
Sent: Thursday, March 22, 2018 4:35 PM
To: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Cc: Pesin, Michael <Michael.Pesin@hq.doe.gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Subject: RE: revised SETO FY18 FOA SI topics

Thanks. Michael and I will coordinate with her.

From: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Date: Thursday, Mar 22, 2018, 4:31 PM
To: Bindewald III, Gilbert <Gilbert.Bindewald@hq.doe.gov>
Cc: Pesin, Michael <Michael.Pesin@hq.doe.gov>, Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Subject: RE: revised SETO FY18 FOA SI topics

HI Gil:

Many thanks for taking the time from your busy schedule to review the FOA in detail and iron out specifics with Guohui.

May I suggest that you feel free to forward to Katie and any others in the organization that may have an interest, please? In so doing, I think we can let protocol work to everyone's efficiency.

- Charlie
  202-287-1987

From: Bindewald III, Gilbert
Sent: Thursday, March 22, 2018 10:42 AM
To: Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Cc: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Pesin, Michael <Michael.Pesin@hq.doe.gov>
Subject: RE: revised SETO FY18 FOA SI topics

Thanks, Guohui. This does address the previous comments that I raised. I appreciate the effort that you made to focus language specifically around PV, while recognizing that solar-based generation technologies will also be part of an integrated power system. I also realize with the omnibus language out that you will want to move forward quickly. As the next step, I would encourage you to share a version with Katie as soon as you feel appropriate.

Thanks
Gil

P.S. I did just notice that 'innovative pathways' is in the bullet list, but no delineated section on that.

From: Yuan, Guohui
Sent: Thursday, March 01, 2018 12:22 PM
To: Bindewald III, Gilbert <Gilbert.Bindewald@hq.doe.gov>
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Subject: revised SETO FY18 FOA SI topics

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Guohui

Rodriguez, Susan (CONTR)

From: Garson, Jennifer
Sent: Monday, July 23, 2018 5:46 PM
To: Jones-Albertus, Becca
Subject: FW: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions
Attachments: 1836 FOA - SMH_PSH - Mgmt Review - Topic 2.2.docx; DE-FOA-0001840_SETO_FY18 _FOA_TOPIC 1 Systems Integration.docx

FYI after a meeting today with Cathy, she requested that these be sent to Katie Jereza for a short briefing on Friday – Tim, Cathy and Katie will be meeting for only 30 minutes and will touch on both SETO and WPTO FOA. (b) (5)

Nothing to be worried about, though. And we can discuss Tim's email earlier re the selections process tomorrow.

From: Garson, Jennifer
Sent: Monday, July 23, 2018 8:42 PM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Moreno, Alejandro <Alejandro.Moreno@ee.doe.gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Grosso, Matthew <Matthew.Grosso@EE.DOe.Gov>
Subject: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions

Tim -

Per our discussion, in advance of the meeting on Friday, please find attached the Topic 2.2 for the Hydro FOA and the Solar Topic 1.

Per the offices, here is the status of the coordination with OE:

<u>Solar Office</u>

- SETO worked closely with Gil Bindewald (OE) on the subtopics and specific language of topic 1 of the FOA.
- SETO requested OE involvement in the review process, but so far OE staff have been unable to participate due to other work commitments.
- SETO will be requesting OE to be part of the Federal Consensus Panel that recommends the selections for the FOA. That panel meets in late August.

<u>Water Office</u>

- Water Power Technologies Office / Hydropower Program has engaged OE on program-level development and strategy for the hydropower grid topics in this FOA.
    - For example, OE staff reviewed the hydropower RFI that issued in February; OE staff are a part of the informal DOE advisory group convened regularly to review current and planned activities including this FOA; and WPTO has made concerted outreach to OE staff to engage on strategy (Gil Bindewald).
- In addition, WPTO has spoken with OE staff on specific topics, including (b) (5)

    - Notably, WPTO director Alejandro Moreno and OE DAS Michael Pesin co-convened a briefing on July 11 to discuss the Energy Storage Program's storage valuation program, as the OE program has invested in economic analytical tools which are currently used by WPTO to evaluate pumped storage hydropower.

- WPTO will invite OE staff to participate in merit review of the FOA and intends to continue to brief OE staff for coordination.

Please let me know if you need any additional information.

Best,
Jenn

Jennifer Garson
Chief of Staff
Office of Deputy Assistant Secretary for Renewable Power
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Jennifer.Garson@ee.doe.gov I (202) 586-0082 (w) I (b) (6) (m)

WPTO Hydro FOA Topic 2.2

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

"Innovative Design Concepts for Standard Modular Hydropower and Pumped-Storage Hydropower"

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001836
FOA Type: Initial
CFDA Number: 81.087

	(b) (5)
FOA Issue Date:	
FOA Informational Webinar (Topic Areas 1 and 2):	
Standard Modular Hydropower Resources Webinar (Topic Area 1 Only):	
Submission Deadline for Concept Papers:	
Submission Deadline for Full Applications:	
Expected Submission Deadline for Replies to Reviewer Comments:	
Expected Date for EERE Selection Notifications:	
Expected Timeframe for Award Negotiations	

B. Topic Area 2 – New Use Cases for Pumped-Storage Hydropower

1. Background

Pumped storage hydropower comprises over 95% of the electrical energy storage in the United States today. Despite its significant contribution to grid-scale storage, new pumped storage hydropower plants are not being built in the U.S. Only one new pumped storage facility has been built since 1970, despite dramatic increases in storage supportive policies in the last ten years.[1] Existing pumped storage operations are shifting to adapt to new resources, market structures, demand patterns, and pricing signals.[2] Pumped storage technology in conventional configurations and uses (e.g. multi-hundred megawatt open- and closed-loop configurations) are complex, custom-designed civil engineering projects which may entail significant regulatory, cost, schedule, and geotechnical risks.

Critical limitations to new development include:

- **Certainty on return on investment:** It is not clear how to evaluate the revenue opportunities of a large storage asset on a forward basis. Establishing investment

[1] Cite Market Report for 1970 date, cite storage policy data.
[2] Reference Hydropower Vision, RFI responses, Market Report and PSH website

certainty over the lifetime of the asset is particularly difficult, compounded by the unpredictability evidenced by the rapid change in the electric system. Most utility and system planning timeframes are only about 20 years. In addition, pumped storage assets, due to their large generating and storage capacity, have the potential to influence market prices as price-makers rather than price-takers, which complicates how market operators interact with and take advantage of these assets. Modeling efforts for storage have advanced, and a recently established project within the Water Power Technologies Office will focus exclusively on improving the practice of valuation for pumped storage.

- **Length of time to commissioning:** The timeframe from site design to commissioning, including permitting, is over 10 years. This presents a significant competitive disadvantage to pumped storage, as the delay prevents developments from responding to a current system opportunity. The lack of certainty for return on investment is even further diminished by needing insight into long-term revenue streams beginning at least 10 years from project initiation. In comparison, provided the controls and communications are established, today's battery storage technologies can be sited and commissioned in less than a year.
- **High initial and total capital costs:** As the electricity system undergoes a transformation, grid-supporting technologies will be required. Supporting technologies on a bulk system scale with transmission-level commitments are evaluated and planned for, but rarely constructed. A portion of this challenge is structural: the significant upfront capital costs of very large supporting assets presents initiation risk and drives decisions toward incremental commitments. Over its lifetime, pumped storage assets may be very cost effective, but they still require substantial initial investment. To meaningfully drive down the total cost of pumped storage, technology and structural strategies must achieve reductions in the initial costs for project development.
- **Siting opportunity and available value streams:** The typically large scale of pumped storage technologies will push development toward large water bodies and locational coincidence of substations for interconnection opportunities. There are several other considerations to siting a pumped storage system that will affect costs and timelines, including environmental effects, scaled development, and integration with other infrastructure to access new revenues and benefits beyond traditional electricity revenues.

2. Description

To address the critical barriers mentioned above, Topic Area 2 explores new use cases for pumped storage hydropower that can improve electricity system resilience, reliability, and economics. Applicants are expected to propose innovative technology concepts, analysis, or enhanced modeling capabilities that define a new, updated role for pumped storage in the evolving electricity system in the United States.

This Topic Area is aligned with WPTO's new grid research initiative to focus investments on innovations which will optimize hydropower resources for a secure, sustainable,

cost-effective, and reliable electricity system, and responds to FY18 Congressional direction to offer a competitive funding opportunity for pumped storage hydropower. This Topic Area is also consistent with DOE's Beyond Batteries initiative, which drives technology beyond cost reductions toward improved performance and enhanced provision of services to the grid.

This Topic Area also builds on a previous FY2016 FOA, DE-FOA-0001455, which issued four awards for new pumped storage innovations that met specific technology characteristics, with the comparable goal of reducing pumped storage costs and timelines. The new emphasis in this FOA, however, is on an increase in value rather than a reduction in levelized costs.

WPTO is therefore soliciting applications for awards in two sub-topic areas:

- *Sub-topic 2.1 – Innovative conceptual designs for pumped storage systems*
- *Sub-topic 2.2 – Modeling and analyzing the role of pumped storage in asset and system optimization*

a. <u>Sub-topic 2.2: Modeling and Analyzing the Role of Pumped Storage in Asset and System Optimization</u>

This sub-topic will support analysis of the technical capabilities of pumped storage to improve electricity system resilience, reliability, and economic efficiency, or to improve the performance of other grid assets. For example, modeling enhancements or analysis could explore the ability of storage to support system-wide strategies to manage fast ramps or high peak loads or investigate operational connections between storage and other grid assets such as solar photovoltaic (PV) or wind energy.

Among the family of storage technologies available and pre-commercial today, pumped storage hydropower facilities have distinguishing attributes. Pumped storage is the only storage technology capable of operating at the transmission level. It is capable of generating energy over a substantial duration of time, of providing high-volume injection or absorption of electricity, and of providing a broad range of essential grid reliability services.

Constructed mostly in the 1960s and 1970s, existing pumped storage hydropower plants were originally designed and optimized for daily energy shifting – pumping water from a lower elevation reservoir to a higher elevation reservoir during low load hours and generating during high-load hours when electricity is in greatest demand – to support continuous and efficient operation of large thermal generation resources.

However, this business model is changing. Today, pumped storage hydropower plants across the country are shifting to new operational paradigms. For certain pumped storage facilities, price swings in the last five years have resulted in an inversion of the traditional pumping-generating pattern, now pumping during the day and generating at

night, as evidenced by the submissions to the WPTO's DE-FOA-0001886: Expanding Hydropower and Pumper Storage's Contribution to Grid Resliency and Reliability Request for Information. In other instances, the timescale is fundamentally different. The traditional daily cycle of high- and low-load is no longer the primary operational driver; instead pumped storage hydropower is used for peak-shaving, intra-hour reliability requirements, or ramping.

If these trends continue, certain price and demand patterns are likely to emerge, some with significant consequences for large-scale storage. Projections from a recent study anticipate higher volatility in prices, very low value energy prices, higher premiums on flexibility and capacity, and inverse pricing spreads over the course of a day to a season. These changes may ripple effects beyond traditional procurement of electricity as energy, capacity, and ancillary services. For example, system operators may increasingly utilize pumped storage facilities as part of the transmission system, to manage transmission utilization and congestion. There are outstanding questions regarding about how well storage assets are afforded access to markets, given their unique operating characteristics, and under what circumstances a storage asset can provide both generation and transmission benefits without compromising market principles.

The optimal future role of pumped storage, both existing and proposed, is still not well-understood. Pumped storage assets can provide a broad range of benefits to the grid and to other assets, but a complete perspective of all of these benefits is rarely illustrated. Typically pumped storage benefits are evaluated at a portfolio-level for a specific purpose, such as transmission planning or resource adequacy over 10-20 years, which does not capture the full operational life (50-60 years) of a pumped storage plant. Capacity and transmission expansion models do not capture many of the services that pumped storage can provide and often overlook externalities. The analytical record is particularly shallow in evaluating pumped storage benefits to other grid assets, due in part to complexity and availability of comprehensive data.

In some instances, a complete perspective on value of pumped storage is limited by the lack of independent, real-world analyses that can be directly applied or used as reference cases. In others, the challenge is rooted in the current tools utilized within operations and planning practices. Models commonly employed in the electric power sector may not be well adapted to effective evaluation of pumped storage solutions, especially advanced technologies that permit even greater operational flexibility.

Technology innovations for pumped storage have focused on increasing plant flexibility with variable speed pumps and ternary (hydraulic bypass) systems. Proposed pumped storage developments may still be designed with fixed-speed pump design due to cost differential for the upgraded systems and uncertainty about the return on investment of utilizing the potential flexibility afforded by more innovative technologies. In addition, it is not clear whether the same technical benefits of flexibility can be achieved between

pumped storage plants and other mechanisms, such as an aggregation of smaller storage solutions or market expansion and design.

Therefore, to reduce the uncertainty regarding future investments and illustrate the value of storage at the bulk scale, this FOA invites applications for analyses and modeling enhancements that would collectively advance an understanding of the capabilities of pumped storage hydropower in electric system optimization or optimization of other grid assets, inclusive of generation and transmission.

This Sub-topic is intended to recruit applications for:

(1) Analyses that would illustrate to what extent, and in which cases, pumped storage hydropower can provide one or more specific material optimization benefits to electric system performance and/or other specific grid assets, or
(2) Modeling enhancements that would make the benefits of pumped storage hydropower more visible, more effectively analyzed, or possible within existing electric system operations and planning practices.

Applications in this sub-topic should evaluate the potential for pumped storage hydropower to provide one or more specific benefits that accrue either to the system or to other assets, in particular benefits that are currently not well understood. An application must articulate its additional value to the current state of knowledge, and make explicit any linkages to benefits to other grid assets. Example linkages include transmission utilization improvements, operating in tandem within the same control footprint, or an adjustment in the merit order (generating stack) that helps other plants operate more efficiently, reduces wear and tear on other machines, uses less fuel, or reduces environmental impacts. Applications should select a real system, rather than theoretical systems and assets, at a meaningful scale. Benefits should be measurable and linked to grid properties such as resilience, reliability, sustainability, or economic efficiency. Table 3 below outlines the requirements for proposed analyses.

Proposed modeling enhancements should address gaps in effective characterization of new advanced pumped storage or full utilization of pumped storage assets. Applications for modeling enhancements should use the gaps analysis provided in [Appendix F] as a guideline for focus areas with the greatest need and the greatest opportunity for impact. The proposed enhancement is not required to be open source in order to be eligible for award under this sub-topic. However, applications should strike a balance between two objectives: *impact* (that at the conclusion of the work, the enhancement will be used and useful) and *availability* (that others can access the enhancement and understand how well it works without excessive cost).

Applications for modeling enhancements should incorporate operations and planning entities that would take advantage of such enhancements as part of the project team. If the proposed work involves a new feature of an existing model under commercial license, applicants should include a demonstration of support or engagement with the

owner of that model. Applicants are strongly encouraged to incorporate partners and stakeholders into the proposed work beyond a demonstration of support.

Responsive applications will:

- Identify how the analysis or modeling enhancement meets the requirements established in Table 3 below or in modeling enhancements Appendix F;
- Demonstrate that the analysis or modeling enhancement would produce an innovative result or an innovative approach within the execution of the work;
- Propose work that will have a substantial, measurable impact on advancing an understanding of the full suite of benefits of pumped storage hydropower; and
- Propose a plan to disseminate the analysis or modeling enhancement to as wide an audience as possible (e.g., publication in the open literature, open source licensing, commercial licensing).

To gauge the extent to which modeling gaps are being addressed, WPTO intends to manage these projects as a portfolio, both in the selection process and during the period of performance. The portfolio of projects may include work being/to be performed at the National Labs and other entities.

Table 3: *Requirements for Proposed Analysis*

Data choice	Data should be appropriate for the work-product goals. For instance, analytical work that focuses on curtailment reduction should use load and variable generation forecasts and operating data that accurately capture curtailment challenges.
Project Team	Where an analysis would describe the optimization of an asset or a system, the project team should include the owner or operator of that asset or system, at minimum evidenced by a letter of support. Applicants are strongly encouraged to incorporate partners and stakeholders into the proposed work beyond a demonstration of support.
Benefits	Benefits must be measurable and linked to grid properties such as resilience, reliability, sustainability, or economic efficiency. For economic benefits, the results should clearly show the lasting value provided to all stakeholders – measured by net benefits such as lower electricity cost, efficient utilization of renewables and load, and others as applicable.
Assumptions and Definitions for Proposed Analysis	• Analyses should be representative of a real system, rather than theoretical systems and assets.

	• The analysis baseline should be representative of existing or expected near-term conditions (e.g., 2020 RPS-based generation mix). • Models used to represent variable generation (e.g., wind and PV solar) should be realistic in terms of generation mix as well as spatial and temporal accuracy (e.g., the variability is not over- or under-represented, plant siting does not skew the results). • The approach to generator retirement should be clearly stated (e.g., if additional generation is added to a model, is some of the existing generation retired, and if so, how were the retirement choices determined?). • The underlying generation mix assumptions for forward-looking grid representations should be clearly defined (e.g., scenario X captures 2030 RPS requirements, scenario Y increases the amount of renewable generation from the current 20% on an annual energy basis to 40%). • Where unexpected forced outages are used in the analysis or modeling efforts, the nature of the forced outage should be described (e.g., fixed in time and amplitude across scenarios or varies from scenario to scenario). • The relevant geographic region should be clearly defined along with the regions connections and reliance on surrounding systems. • The generation mix for the baseline and each scenario should be clearly identified by generation type (e.g., airframe-derivative, open cycle combustion turbines) and capacity. The generation mix of interconnected systems to the relevant region should also be reported. • The flexibility assumptions (e.g., ramp rate per minute as a percentage of rated capacity, minimum stable level, and start time) for each type (and size class, if applicable) of generation should be clearly stated. • The capacity reserve for the system (and each scenario or sensitivity) should be clearly stated. • Peak variable generation penetration should be reported both in terms of time of occurrence and percent of peak load. • The type of pumped storage hydropower technology should be clearly defined (synchronous, inverter-based, variable speed pumping, and so forth).

WPTO Hydro FOA Topic 2.2

i. Work to be Conducted

At the end of the period of performance:

- *Analysis*: Awardees will produce a detailed, written technical report that describes the project team, data inputs, methodological approach, tools and models utilized, results of the analysis, dissemination plans, challenges in executing the work, and remaining gaps. All projects awardees will present publicly-sharable results in-person to WPTO and involved national laboratories at project conclusion at a summit event.
- *Modeling enhancement: Awardees will produce a detailed written technical report that describes the modeling enhancement, its applicability and effect, dissemination and engagement, and remaining gaps. If the work is open-source, additional requirements for disposition of source code may apply. All applicants should anticipate provisions relating to Intellectual Property (IP) as part of award negotiation. All awardees will demonstrate the modeling enhancements in-person to WPTO and involved national laboratories at project conclusion.*

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

Solar Energy Technologies Office (SETO)
FY2018 Funding Opportunity Announcement (FOA)

FOA Number: DE-FOA-0001840
CFDA Number: 81.087

FOA Issue Date:	April 17th, 2018
Submission Deadline for Letter of Intent (LOI):	May 4th, 2018, 3:00pm ET
Informational Webinar: Visit EERE exchange FOA description for details regarding webinar timing and registration	
Submission Deadline for Concept Papers: • Applicants must submit a Concept Paper by 3:00pm ET on the due date listed above to be eligible to submit a Full Application. Topic Areas 2.1 and 3.1 SIPS applications must resubmit their LOI again as a concept paper by the concept paper deadline above to clear an administrative software restriction of EERE Exchange.	May 9th, 2018, 3:00pm ET
Submission Deadline for Full Applications and SIPS Applications:	(b) (5)
Expected Submission Deadline for Replies to Reviewer Comments:	August 2nd, 2018, 3:00pm ET
Expected Timeframe for EERE Selection Notifications:	September 2018

Topic 1 Advanced Solar Systems Integration Technologies

The Systems Integration (SI) subprogram supports early-stage research and development that advances the reliable, resilient, secure and affordable integration of solar energy onto the U.S. electric grid. For more in-depth discussion of solar grid integration, please visit "Solar Grid Integration" https://energy.gov/eere/solar/downloads/technical-background-2018-seto-funding-opportunity-announcement.

In 2011, solar power comprised less than 0.1% of the U.S. electricity supply with an installed capacity of just 1.2 gigawatts (GW). Solar now supplies nearly 2% of the annual U.S. electricity demand[1] with an installed capacity of roughly 47 GWs[2], and is continuing to grow. According to U.S. Energy Information Administration (EIA), in some states and regions, solar represents up to

[1] U.S. Energy Information Administration (EIA), Electric Power Monthly with Data for November 2017, published in January 2018. https://www.eia.gov/electricity/monthly/current_month/epm.pdf
[2] Source: Solar Energy Industries Association (SEIA), http://www.seia.org/

15% of total annual electricity generation. Instantaneous solar generation can reach a much higher level, more than 40% in some cases.[3]

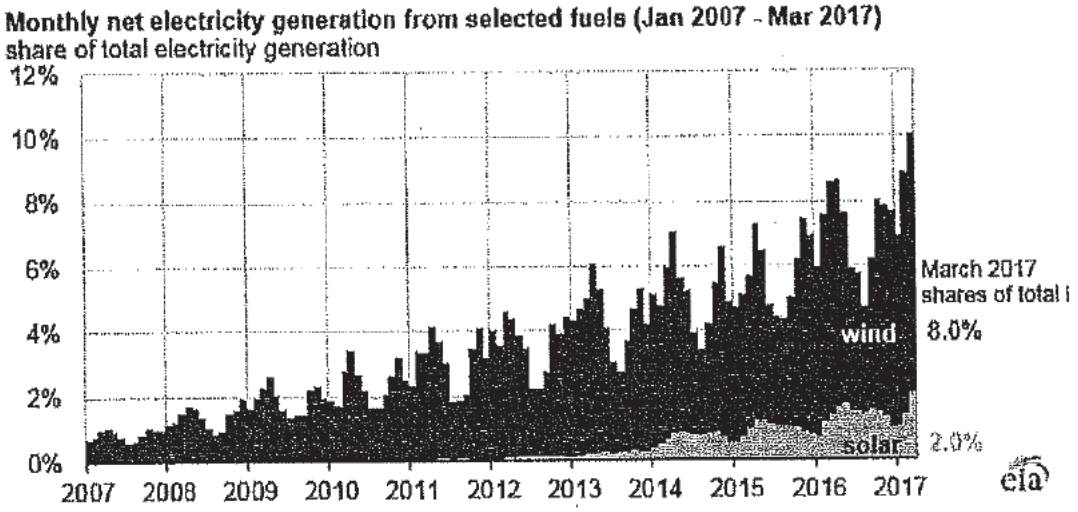


Figure 1: For the first time, in March 2017 solar supplied 2% of the U.S. electricity demand, while wind and solar combined accounted for 10% of the U.S. electricity generation. (Source: EIA)

As the penetration of solar energy on the grid continues to increase, it becomes imperative to identify the associated technical, economic and regulatory challenges, and to develop impactful solutions in order to ensure compatibility with the existing grid and a smooth transition to a secure, reliable and resilient grid of the future.

Traditional grid architecture was based on large-scale centralized generation remotely located from consumers, hierarchical control structures with minimal feedback, limited renewable generation such as wind and solar, limited energy storage and passive loads. A modern grid must be reliable, resilient and secure. It must have the ability to dynamically optimize grid operations and resources, rapidly detect and mitigate disturbances, engage millions if not billions more intelligent devices, integrate diverse generation sources (including both conventional and renewable types), integrate demand response and energy efficiency resources, enable customers to manage their electricity use and participate in markets, and provide strong protection against physical and cyber risks.

The current business-as-usual trajectory for the electric industry will not result in a timely transition to a modernized grid[4]. Since large investments in the past and today in the nation's electric grid infrastructure will remain in service for decades, it is important that the U.S. make

[3] For example, in the California Independent System Operator (CAISO) Monthly Renewables Performance Report, the 5-minute market data shows that at the maximum solar served almost 45% of the load in September 2017. See http://www.caiso.com/Documents/MonthlyRenewablesPerformanceReport-Nov2017.html

[4] Department of Energy Grid Modernization Multiyear Program Plan (MYPP)

smart decisions to invest in enabling and forward-looking technologies that will support the creation of a modern grid infrastructure in the coming years. There is a critical need to foster innovations and new technology adoptions by decreasing regulatory, market and business model uncertainties, demonstrating technology maturity and reducing implementation risks.

The Department of Energy's Grid Modernization Initiative[5], is a cross-cutting effort that aligns grid modernization efforts across the multiple DOE Program Offices. As part of the Grid Modernization Initiative (GMI), the SI subprogram supports targeted technology research and development (R&D) that addresses the technical challenges with achieving higher solar penetration, while supporting a safe, reliable, secure and cost-effective electric power system.

More broadly, the Grid Modernization Initiative focuses on the development of holistic solutions for the grid of the future. Several key technology areas have been identified in the Grid Modernization Multi-Year Program Plan (MYPP)[6]:

- Devices and Integrated Systems Testing;
- Sensing and Measurements;
- Systems Operations, Power Flow and Control;
- Design and Planning Tools;
- Security and Resilience; and
- Institutional Support.

Progress in all of these areas is considered crucial for the effective grid integration of solar energy and modernization of the grid, as illustrated in Figure 2. A specific focus of the SETO Systems Integration subprogram includes understanding the impacts of increasing penetration of solar energy on grid reliability and power quality, developing best practices for interconnecting and integrating solar with energy storage and synergistic technologies, addressing the variability of solar generation, researching power electronic technologies for flexible power flow control, enhancing situational awareness of solar generation at the grid edge and informing the standardization of interconnection, interoperability, and cybersecurity for PV and other distributed energy resources (DER) systems. Taking these all together, the goal is to advance the knowledge-base and the ability to integrate solar generation, at scale, into electric transmission and distribution systems in a cost-effective, secure, and reliable manner.

[5] Accessed 01 November 2017, https://energy.gov/under-secretary-science-and-energy/grid-modernization-initiative

[6] Department of Energy Grid Modernization Multiyear Program Plan (MYPP), Accessed 01 November 2017, https://energy.gov/downloads/grid-modernization-multi-year-program-plan-mypp

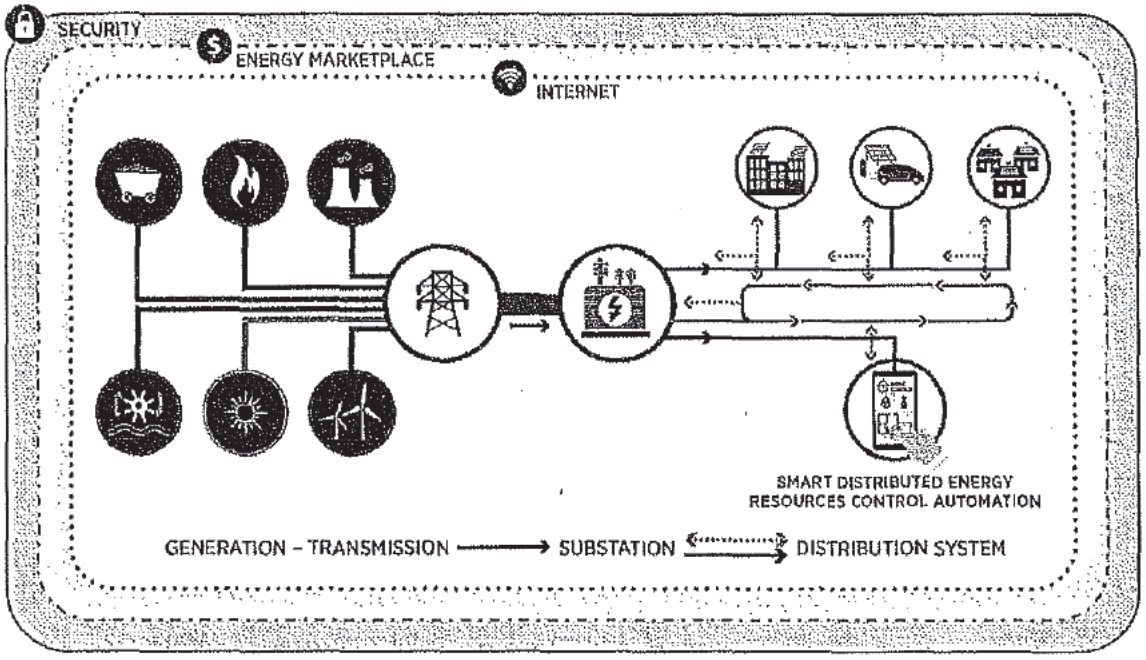


Figure 2: Illustration of high level solar penetration in a modernized electricity power system.

In this FOA the SETO Systems Integration subprogram seeks to fund research in the following topic areas:

- Adaptive Solar Grid Integration;
- Solar Observability;
- Solar + X; and
- Innovative Pathways.

Modernizing the grid also requires a workforce capable of understanding and managing this dynamic and digital environment. For those interested in developing proposals related to training the digital grid workforce of the future, please refer to Topic 4 of this FOA.

Topic 1.1 Adaptive Solar Grid Integration

This topic will support applications to research and field validate innovative technologies that enable distributed solar photovoltaic (PV) to contribute to grid reliability and resilience by providing solar dispatchability and grid-support functions—including energy, capacity, and reliability and resilience services. These technologies can be deployed throughout the electric distribution system. The approaches will focus on developing flexible interconnection requirements and dynamic hosting capacity concepts for solar PV as opposed to today's prevalent "firm" interconnection requirements and static hosting capacity planning. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs), Through the intelligent control of the distributed assets,

flexible interconnection requirements can increase the overall hosting capacity for solar and DERs in the distribution system, support diverse customer interconnection choices, improve system reliability and resilience, and reduce PV curtailment. Applications must consider diverse DER options (e.g. PV, energy storage, flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed technologies in the hosting capacity analysis. It should also be shown in these solutions how a fleet of PV systems from multiple customers at 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, control hardware and software innovations for smart PV inverters and DER management system (DERMS) that allow more flexibility to interconnection and operation of small scale PV and other DER systems.

Topic 1.2 Solar Observability

This topic will support applications to research, develop and validate observability or situational awareness technologies at the grid edge to support planning and operation with high PV penetration. Primary focus areas include PV-integrated sensor technologies, secure and robust communication, advanced data analytics (including machine learning) and detection of cyber-intrusion. Projects may also be considered with secondary focus areas, which enhance grid-edge observability of solar systems by integration with additional planning, operations and business unit systems. All applications should have an assessment of economic viability of the system or component in the application and as part of the project.

Topic 1.3 Solar + X

This topic will support applications to research and field validate innovative approaches to integrate Behind-the-Meter (BTM) solar PV with synergistic technologies (including but not limited to energy storage, building controls, demand response, electric vehicles, and other DERs) to support dispatchability and provide grid services – including energy, capacity, and reliability and resilience services – as a single control point. Projects will focus on research and development in control coordination and optimization of BTM customer-owned and co-located behind a single (master) meter: PV, storage, and other DER assets in response to broader system-wide conditions, with key interest in utilizing DER assets to provide critical power during outages. Projects may consider traditional "firm" DER interconnection requirements as well as emerging flexible interconnection approaches (such as those sought in Topic 1.1) and innovative compensation mechanisms. In an effort to minimize the overall system cost for solar integration arising from new hardware deployment, such as battery storage, , applicants are encouraged to consider how solar and load estimation, advanced data analytics, and artificial intelligence can be utilized in the operations of their proposed systems. All Applicants should have an assessment of economic viability of the system or component in the application as part of the project.

Topic 1.4 Innovative Pathways: Systems Integration

This topic will explore innovative approaches and models to accelerate the transfer of systems integration and related technologies from the lab into the real world. Rather than funding

research on individual technology solutions directly, applicants will research and develop new methods to advance research portfolios of solar (and related) technologies and overcome challenges endemic to the solar technology transfer space, including knowledge gaps between the research/industrial communities and constraints on access to necessary resources. Applicants must demonstrate a realistic pathway to test, scale and sustain the model after the period of performance. Potential areas of interest include, but are not limited to, models to deploy alternative capital (e.g., local public-private partnerships, foundations) for technology R&D or transfer, structures to incentivize industry-researcher collaboration, approaches to lower barriers such that new entrants can leverage existing facilities, data and build capacity (e.g., dormant manufacturing capacity or underutilized laboratory space), and methods to drive down the cost and accelerate processes around hardware validation and certification.

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Monday, July 23, 2018 6:33 PM
To: Garson, Jennifer
Subject: RE: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions

Thanks for the heads up. Please let us know how the meeting goes!

From: Garson, Jennifer <Jennifer.Garson@EE.doe.gov>
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    - For example, OE staff reviewed the hydropower RFI that issued in February; OE staff are a part of the informal DOE advisory group convened regularly to review current and planned activities including this FOA; and WPTO has made concerted outreach to OE staff to engage on strategy (Gil Bindewald).

- In addition, WPTO has spoken with OE staff on specific topics, including (b) (5)

    - Notably, WPTO director Alejandro Moreno and OE DAS Michael Pesin co-convened a briefing on July 11 to discuss the Energy Storage Program's storage valuation program, as the OE program has invested in economic analytical tools which are currently used by WPTO to evaluate pumped storage hydropower.
- WPTO will invite OE staff to participate in merit review of the FOA and intends to continue to brief OE staff for coordination.

Please let me know if you need any additional information.

Best,
Jenn

Jennifer Garson
Chief of Staff
Office of Deputy Assistant Secretary for Renewable Power
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Jennifer.Garson@ee.doe.gov | (202) 586-0082 (w) | (b) (6) (m)

Rodriguez, Susan (CONTR)

From: Unruh, Timothy
Sent: Wednesday, July 25, 2018 9:05 AM
To: Garson, Jennifer
Subject: FW: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions
Attachments: 1836 FOA - SMH_PSH - Mgmt Review - Topic 2.2.docx; DE-FOA-0001840_SETO_FY18 _FOA_TOPIC 1 Systems Integration.docx

Fyi

From: "Unruh, Timothy" <Timothy.Unruh@EE.Doe.Gov>
Sent: Jul 25, 2018 9:39 AM
To: "Jereza, Catherine" <Catherine.Jereza@Hq.Doe.Gov>
Cc: "Pesin, Michael" <Michael.Pesin@hq.doe.gov>; "Fitzsimmons, Alexander" <Alexander.Fitzsimmons@ee.doe.gov>
Subject: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions

In my review of two FOA efforts with Cathy Tripodi on Monday, she wanted your thoughts on i) the analysis proposed by the Water Power Technology Office's (WPTO) TOPIC 2.2, attached, and, ii) your knowledge on WPTO and Solar Energy Technology Office's (SETO) coordination with OE.

She has requested a meeting for Friday, but I wanted to get you the information prior to the meeting. Let me know if you have questions. Below is a summary of the coordination history and plans as reported from each office for your reference.

Solar Office

- SETO worked closely with Gil Bindewald (OE) on the subtopics and specific language of topic 1 of the FOA.
- SETO requested OE involvement in the review process, but so far OE staff have been unable to participate due to other work commitments.
- SETO will be requesting OE to be part of the Federal Consensus Panel that recommends the selections for the FOA. That panel meets in late August.

Water Office

- Water Power Technologies Office / Hydropower Program has engaged OE on program-level development and strategy for the hydropower grid topics in this FOA.
    - For example, OE staff reviewed the hydropower RFI that issued in February; OE staff are a part of the informal DOE advisory group convened regularly to review current and planned activities including this FOA; and WPTO has made concerted outreach to OE staff to engage on strategy (Gil Bindewald).
- In addition, WPTO has spoken with OE staff on specific topics, including (b) (5)

    - Notably, WPTO director Alejandro Moreno and OE DAS Michael Pesin co-convened a briefing on July 11 to discuss the Energy Storage Program's storage valuation program, as the OE program has invested in economic analytical tools which are currently used by WPTO to evaluate pumped storage hydropower.
- WPTO will invite OE staff to participate in merit review of the FOA and intends to continue to brief OE staff for coordination.

WPTO Hydro FOA Topic 2.2

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

"Innovative Design Concepts for Standard Modular Hydropower and Pumped-Storage Hydropower"

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001836
FOA Type: Initial
CFDA Number: 81.087

	(b) (5)
FOA Issue Date:	
FOA Informational Webinar (Topic Areas 1 and 2):	
Standard Modular Hydropower Resources Webinar (Topic Area 1 Only):	
Submission Deadline for Concept Papers:	
Submission Deadline for Full Applications:	
Expected Submission Deadline for Replies to Reviewer Comments:	
Expected Date for EERE Selection Notifications:	
Expected Timeframe for Award Negotiations	

B. Topic Area 2 – New Use Cases for Pumped-Storage Hydropower

1. Background

Pumped storage hydropower comprises over 95% of the electrical energy storage in the United States today. Despite its significant contribution to grid-scale storage, new pumped storage hydropower plants are not being built in the U.S. Only one new pumped storage facility has been built since 1970, despite dramatic increases in storage supportive policies in the last ten years.[1] Existing pumped storage operations are shifting to adapt to new resources, market structures, demand patterns, and pricing signals.[2] Pumped storage technology in conventional configurations and uses (e.g. multi-hundred megawatt open- and closed-loop configurations) are complex, custom-designed civil engineering projects which may entail significant regulatory, cost, schedule, and geotechnical risks.

Critical limitations to new development include:

- **Certainty on return on investment:** It is not clear how to evaluate the revenue opportunities of a large storage asset on a forward basis. Establishing investment

[1] Cite Market Report for 1970 date, cite storage policy data.
[2] Reference Hydropower Vision, RFI responses, Market Report and PSH website

certainty over the lifetime of the asset is particularly difficult, compounded by the unpredictability evidenced by the rapid change in the electric system. Most utility and system planning timeframes are only about 20 years. In addition, pumped storage assets, due to their large generating and storage capacity, have the potential to influence market prices as price-makers rather than price-takers, which complicates how market operators interact with and take advantage of these assets. Modeling efforts for storage have advanced, and a recently established project within the Water Power Technologies Office will focus exclusively on improving the practice of valuation for pumped storage.

- **Length of time to commissioning:** The timeframe from site design to commissioning, including permitting, is over 10 years. This presents a significant competitive disadvantage to pumped storage, as the delay prevents developments from responding to a current system opportunity. The lack of certainty for return on investment is even further diminished by needing insight into long-term revenue streams beginning at least 10 years from project initiation. In comparison, provided the controls and communications are established, today's battery storage technologies can be sited and commissioned in less than a year.
- **High initial and total capital costs:** As the electricity system undergoes a transformation, grid-supporting technologies will be required. Supporting technologies on a bulk system scale with transmission-level commitments are evaluated and planned for, but rarely constructed. A portion of this challenge is structural: the significant upfront capital costs of very large supporting assets presents initiation risk and drives decisions toward incremental commitments. Over its lifetime, pumped storage assets may be very cost effective, but they still require substantial initial investment. To meaningfully drive down the total cost of pumped storage, technology and structural strategies must achieve reductions in the initial costs for project development.
- **Siting opportunity and available value streams:** The typically large scale of pumped storage technologies will push development toward large water bodies and locational coincidence of substations for interconnection opportunities. There are several other considerations to siting a pumped storage system that will affect costs and timelines, including environmental effects, scaled development, and integration with other infrastructure to access new revenues and benefits beyond traditional electricity revenues.

2. Description

To address the critical barriers mentioned above, Topic Area 2 explores new use cases for pumped storage hydropower that can improve electricity system resilience, reliability, and economics. Applicants are expected to propose innovative technology concepts, analysis, or enhanced modeling capabilities that define a new, updated role for pumped storage in the evolving electricity system in the United States.

This Topic Area is aligned with WPTO's new grid research initiative to focus investments on innovations which will optimize hydropower resources for a secure, sustainable,

cost-effective, and reliable electricity system, and responds to FY18 Congressional direction to offer a competitive funding opportunity for pumped storage hydropower. This Topic Area is also consistent with DOE's Beyond Batteries initiative, which drives technology beyond cost reductions toward improved performance and enhanced provision of services to the grid.

This Topic Area also builds on a previous FY2016 FOA, DE-FOA-0001455, which issued four awards for new pumped storage innovations that met specific technology characteristics, with the comparable goal of reducing pumped storage costs and timelines. The new emphasis in this FOA, however, is on an increase in value rather than a reduction in levelized costs.

WPTO is therefore soliciting applications for awards in two sub-topic areas:

- *Sub-topic 2.1 – Innovative conceptual designs for pumped storage systems*
- *Sub-topic 2.2 – Modeling and analyzing the role of pumped storage in asset and system optimization*

a. <u>Sub-topic 2.2: Modeling and Analyzing the Role of Pumped Storage in Asset and System Optimization</u>

This sub-topic will support analysis of the technical capabilities of pumped storage to improve electricity system resilience, reliability, and economic efficiency, or to improve the performance of other grid assets. For example, modeling enhancements or analysis could explore the ability of storage to support system-wide strategies to manage fast ramps or high peak loads or investigate operational connections between storage and other grid assets such as solar photovoltaic (PV) or wind energy.

Among the family of storage technologies available and pre-commercial today, pumped storage hydropower facilities have distinguishing attributes. Pumped storage is the only storage technology capable of operating at the transmission level. It is capable of generating energy over a substantial duration of time, of providing high-volume injection or absorption of electricity, and of providing a broad range of essential grid reliability services.

Constructed mostly in the 1960s and 1970s, existing pumped storage hydropower plants were originally designed and optimized for daily energy shifting – pumping water from a lower elevation reservoir to a higher elevation reservoir during low load hours and generating during high-load hours when electricity is in greatest demand – to support continuous and efficient operation of large thermal generation resources.

However, this business model is changing. Today, pumped storage hydropower plants across the country are shifting to new operational paradigms. For certain pumped storage facilities, price swings in the last five years have resulted in an inversion of the traditional pumping-generating pattern, now pumping during the day and generating at

night, as evidenced by the submissions to the WPTO's DE-FOA-0001886: Expanding Hydropower and Pumper Storage's Contribution to Grid Resliency and Reliability Request for Information. In other instances, the timescale is fundamentally different. The traditional daily cycle of high- and low-load is no longer the primary operational driver; instead pumped storage hydropower is used for peak-shaving, intra-hour reliability requirements, or ramping.

If these trends continue, certain price and demand patterns are likely to emerge, some with significant consequences for large-scale storage. Projections from a recent study anticipate higher volatility in prices, very low value energy prices, higher premiums on flexibility and capacity, and inverse pricing spreads over the course of a day to a season. These changes may ripple effects beyond traditional procurement of electricity as energy, capacity, and ancillary services. For example, system operators may increasingly utilize pumped storage facilities as part of the transmission system, to manage transmission utilization and congestion. There are outstanding questions regarding about how well storage assets are afforded access to markets, given their unique operating characteristics, and under what circumstances a storage asset can provide both generation and transmission benefits without compromising market principles.

The optimal future role of pumped storage, both existing and proposed, is still not well-understood. Pumped storage assets can provide a broad range of benefits to the grid and to other assets, but a complete perspective of all of these benefits is rarely illustrated. Typically pumped storage benefits are evaluated at a portfolio-level for a specific purpose, such as transmission planning or resource adequacy over 10-20 years, which does not capture the full operational life (50-60 years) of a pumped storage plant. Capacity and transmission expansion models do not capture many of the services that pumped storage can provide and often overlook externalities. The analytical record is particularly shallow in evaluating pumped storage benefits to other grid assets, due in part to complexity and availability of comprehensive data.

In some instances, a complete perspective on value of pumped storage is limited by the lack of independent, real-world analyses that can be directly applied or used as reference cases. In others, the challenge is rooted in the current tools utilized within operations and planning practices. Models commonly employed in the electric power sector may not be well adapted to effective evaluation of pumped storage solutions, especially advanced technologies that permit even greater operational flexibility.

Technology innovations for pumped storage have focused on increasing plant flexibility with variable speed pumps and ternary (hydraulic bypass) systems. Proposed pumped storage developments may still be designed with fixed-speed pump design due to cost differential for the upgraded systems and uncertainty about the return on investment of utilizing the potential flexibility afforded by more innovative technologies. In addition, it is not clear whether the same technical benefits of flexibility can be achieved between

pumped storage plants and other mechanisms, such as an aggregation of smaller storage solutions or market expansion and design.

Therefore, to reduce the uncertainty regarding future investments and illustrate the value of storage at the bulk scale, this FOA invites applications for analyses and modeling enhancements that would collectively advance an understanding of the capabilities of pumped storage hydropower in electric system optimization or optimization of other grid assets, inclusive of generation and transmission.

This Sub-topic is intended to recruit applications for:

(1) Analyses that would illustrate to what extent, and in which cases, pumped storage hydropower can provide one or more specific material optimization benefits to electric system performance and/or other specific grid assets, or
(2) Modeling enhancements that would make the benefits of pumped storage hydropower more visible, more effectively analyzed, or possible within existing electric system operations and planning practices.

Applications in this sub-topic should evaluate the potential for pumped storage hydropower to provide one or more specific benefits that accrue either to the system or to other assets, in particular benefits that are currently not well understood. An application must articulate its additional value to the current state of knowledge, and make explicit any linkages to benefits to other grid assets. Example linkages include transmission utilization improvements, operating in tandem within the same control footprint, or an adjustment in the merit order (generating stack) that helps other plants operate more efficiently, reduces wear and tear on other machines, uses less fuel, or reduces environmental impacts. Applications should select a real system, rather than theoretical systems and assets, at a meaningful scale. Benefits should be measurable and linked to grid properties such as resilience, reliability, sustainability, or economic efficiency. Table 3 below outlines the requirements for proposed analyses.

Proposed modeling enhancements should address gaps in effective characterization of new advanced pumped storage or full utilization of pumped storage assets. Applications for modeling enhancements should use the gaps analysis provided in [Appendix F] as a guideline for focus areas with the greatest need and the greatest opportunity for impact. The proposed enhancement is not required to be open source in order to be eligible for award under this sub-topic. However, applications should strike a balance between two objectives: *impact* (that at the conclusion of the work, the enhancement will be used and useful) and *availability* (that others can access the enhancement and understand how well it works without excessive cost).

Applications for modeling enhancements should incorporate operations and planning entities that would take advantage of such enhancements as part of the project team. If the proposed work involves a new feature of an existing model under commercial license, applicants should include a demonstration of support or engagement with the

owner of that model. Applicants are strongly encouraged to incorporate partners and stakeholders into the proposed work beyond a demonstration of support.

Responsive applications will:

- Identify how the analysis or modeling enhancement meets the requirements established in Table 3 below or in modeling enhancements Appendix F;
- Demonstrate that the analysis or modeling enhancement would produce an innovative result or an innovative approach within the execution of the work;
- Propose work that will have a substantial, measurable impact on advancing an understanding of the full suite of benefits of pumped storage hydropower; and
- Propose a plan to disseminate the analysis or modeling enhancement to as wide an audience as possible (e.g., publication in the open literature, open source licensing, commercial licensing).

To gauge the extent to which modeling gaps are being addressed, WPTO intends to manage these projects as a portfolio, both in the selection process and during the period of performance. The portfolio of projects may include work being/to be performed at the National Labs and other entities.

***Table 3:** Requirements for Proposed Analysis*

Data choice	Data should be appropriate for the work-product goals. For instance, analytical work that focuses on curtailment reduction should use load and variable generation forecasts and operating data that accurately capture curtailment challenges.
Project Team	Where an analysis would describe the optimization of an asset or a system, the project team should include the owner or operator of that asset or system, at minimum evidenced by a letter of support. Applicants are strongly encouraged to incorporate partners and stakeholders into the proposed work beyond a demonstration of support.
Benefits	Benefits must be measurable and linked to grid properties such as resilience, reliability, sustainability, or economic efficiency. For economic benefits, the results should clearly show the lasting value provided to all stakeholders – measured by net benefits such as lower electricity cost, efficient utilization of renewables and load, and others as applicable.
Assumptions and Definitions for Proposed Analysis	• Analyses should be representative of a real system, rather than theoretical systems and assets.

	• The analysis baseline should be representative of existing or expected near-term conditions (e.g., 2020 RPS-based generation mix). • Models used to represent variable generation (e.g., wind and PV solar) should be realistic in terms of generation mix as well as spatial and temporal accuracy (e.g., the variability is not over- or under-represented, plant siting does not skew the results). • The approach to generator retirement should be clearly stated (e.g., if additional generation is added to a model, is some of the existing generation retired, and if so, how were the retirement choices determined?). • The underlying generation mix assumptions for forward-looking grid representations should be clearly defined (e.g., scenario X captures 2030 RPS requirements, scenario Y increases the amount of renewable generation from the current 20% on an annual energy basis to 40%). • Where unexpected forced outages are used in the analysis or modeling efforts, the nature of the forced outage should be described (e.g., fixed in time and amplitude across scenarios or varies from scenario to scenario). • The relevant geographic region should be clearly defined along with the regions connections and reliance on surrounding systems. • The generation mix for the baseline and each scenario should be clearly identified by generation type (e.g., airframe-derivative, open cycle combustion turbines) and capacity. The generation mix of interconnected systems to the relevant region should also be reported. • The flexibility assumptions (e.g., ramp rate per minute as a percentage of rated capacity, minimum stable level, and start time) for each type (and size class, if applicable) of generation should be clearly stated. • The capacity reserve for the system (and each scenario or sensitivity) should be clearly stated. • Peak variable generation penetration should be reported both in terms of time of occurrence and percent of peak load. • The type of pumped storage hydropower technology should be clearly defined (synchronous, inverter-based, variable speed pumping, and so forth).

i. Work to be Conducted

At the end of the period of performance:

- *Analysis*: Awardees will produce a detailed, written technical report that describes the project team, data inputs, methodological approach, tools and models utilized, results of the analysis, dissemination plans, challenges in executing the work, and remaining gaps. All projects awardees will present publicly-sharable results in-person to WPTO and involved national laboratories at project conclusion at a summit event.
- *Modeling enhancement: Awardees will produce a detailed written technical report that describes the modeling enhancement, its applicability and effect, dissemination and engagement, and remaining gaps. If the work is open-source, additional requirements for disposition of source code may apply. All applicants should anticipate provisions relating to Intellectual Property (IP) as part of award negotiation. All awardees will demonstrate the modeling enhancements in-person to WPTO and involved national laboratories at project conclusion.*

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

Solar Energy Technologies Office (SETO)
FY2018 Funding Opportunity Announcement (FOA)

FOA Number: DE-FOA-0001840
CFDA Number: 81.087

FOA Issue Date:	April 17th, 2018
Submission Deadline for Letter of Intent (LOI):	May 4th, 2018, 3:00pm ET
Informational Webinar: Visit EERE exchange FOA description for details regarding webinar timing and registration	
Submission Deadline for Concept Papers: • Applicants must submit a Concept Paper by 3:00pm ET on the due date listed above to be eligible to submit a Full Application. Topic Areas 2.1 and 3.1 SIPS applications must resubmit their LOI again as a concept paper by the concept paper deadline above to clear an administrative software restriction of EERE Exchange.	May 9th, 2018, 3:00pm ET
Submission Deadline for Full Applications and SIPS Applications:	(b) (5)
Expected Submission Deadline for Replies to Reviewer Comments:	August 2nd, 2018, 3:00pm ET
Expected Timeframe for EERE Selection Notifications:	September 2018

Topic 1 Advanced Solar Systems Integration Technologies

The Systems Integration (SI) subprogram supports early-stage research and development that advances the reliable, resilient, secure and affordable integration of solar energy onto the U.S. electric grid. For more in-depth discussion of solar grid integration, please visit "Solar Grid Integration" https://energy.gov/eere/solar/downloads/technical-background-2018-seto-funding-opportunity-announcement.

In 2011, solar power comprised less than 0.1% of the U.S. electricity supply with an installed capacity of just 1.2 gigawatts (GW). Solar now supplies nearly 2% of the annual U.S. electricity demand[1] with an installed capacity of roughly 47 GWs[2], and is continuing to grow. According to U.S. Energy Information Administration (EIA), in some states and regions, solar represents up to

[1] U.S. Energy Information Administration (EIA), Electric Power Monthly with Data for November 2017, published in January 2018. https://www.eia.gov/electricity/monthly/current_month/epm.pdf

[2] Source: Solar Energy Industries Association (SEIA), http://www.seia.org/

15% of total annual electricity generation. Instantaneous solar generation can reach a much higher level, more than 40% in some cases.[3]

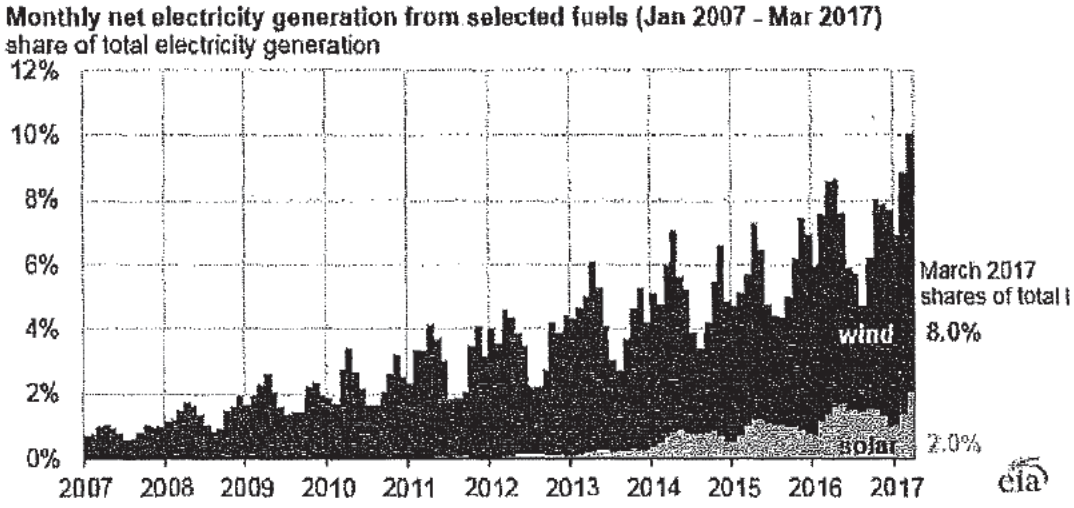


Figure 1: For the first time, in March 2017 solar supplied 2% of the U.S. electricity demand, while wind and solar combined accounted for 10% of the U.S. electricity generation. (Source: EIA)

As the penetration of solar energy on the grid continues to increase, it becomes imperative to identify the associated technical, economic and regulatory challenges, and to develop impactful solutions in order to ensure compatibility with the existing grid and a smooth transition to a secure, reliable and resilient grid of the future.

Traditional grid architecture was based on large-scale centralized generation remotely located from consumers, hierarchical control structures with minimal feedback, limited renewable generation such as wind and solar, limited energy storage and passive loads. A modern grid must be reliable, resilient and secure. It must have the ability to dynamically optimize grid operations and resources, rapidly detect and mitigate disturbances, engage millions if not billions more intelligent devices, integrate diverse generation sources (including both conventional and renewable types), integrate demand response and energy efficiency resources, enable customers to manage their electricity use and participate in markets, and provide strong protection against physical and cyber risks.

The current business-as-usual trajectory for the electric industry will not result in a timely transition to a modernized grid[4]. Since large investments in the past and today in the nation's electric grid infrastructure will remain in service for decades, it is important that the U.S. make

[3] For example, in the California Independent System Operator (CAISO) Monthly Renewables Performance Report, the 5-minute market data shows that at the maximum solar served almost 45% of the load in September 2017. See http://www.caiso.com/Documents/MonthlyRenewablesPerformanceReport-Nov2017.html

[4] Department of Energy Grid Modernization Multiyear Program Plan (MYPP)

smart decisions to invest in enabling and forward-looking technologies that will support the creation of a modern grid infrastructure in the coming years. There is a critical need to foster innovations and new technology adoptions by decreasing regulatory, market and business model uncertainties, demonstrating technology maturity and reducing implementation risks.

The Department of Energy's Grid Modernization Initiative[5], is a cross-cutting effort that aligns grid modernization efforts across the multiple DOE Program Offices. As part of the Grid Modernization Initiative (GMI), the SI subprogram supports targeted technology research and development (R&D) that addresses the technical challenges with achieving higher solar penetration, while supporting a safe, reliable, secure and cost-effective electric power system.

More broadly, the Grid Modernization Initiative focuses on the development of holistic solutions for the grid of the future. Several key technology areas have been identified in the Grid Modernization Multi-Year Program Plan (MYPP)[6]:

- Devices and Integrated Systems Testing;
- Sensing and Measurements;
- Systems Operations, Power Flow and Control;
- Design and Planning Tools;
- Security and Resilience; and
- Institutional Support.

Progress in all of these areas is considered crucial for the effective grid integration of solar energy and modernization of the grid, as illustrated in Figure 2. A specific focus of the SETO Systems Integration subprogram includes understanding the impacts of increasing penetration of solar energy on grid reliability and power quality, developing best practices for interconnecting and integrating solar with energy storage and synergistic technologies, addressing the variability of solar generation, researching power electronic technologies for flexible power flow control, enhancing situational awareness of solar generation at the grid edge and informing the standardization of interconnection, interoperability, and cybersecurity for PV and other distributed energy resources (DER) systems. Taking these all together, the goal is to advance the knowledge-base and the ability to integrate solar generation, at scale, into electric transmission and distribution systems in a cost-effective, secure, and reliable manner.

[5] Accessed 01 November 2017, https://energy.gov/under-secretary-science-and-energy/grid-modernization-initiative

[6] Department of Energy Grid Modernization Multiyear Program Plan (MYPP), Accessed 01 November 2017, https://energy.gov/downloads/grid-modernization-multi-year-program-plan-mypp

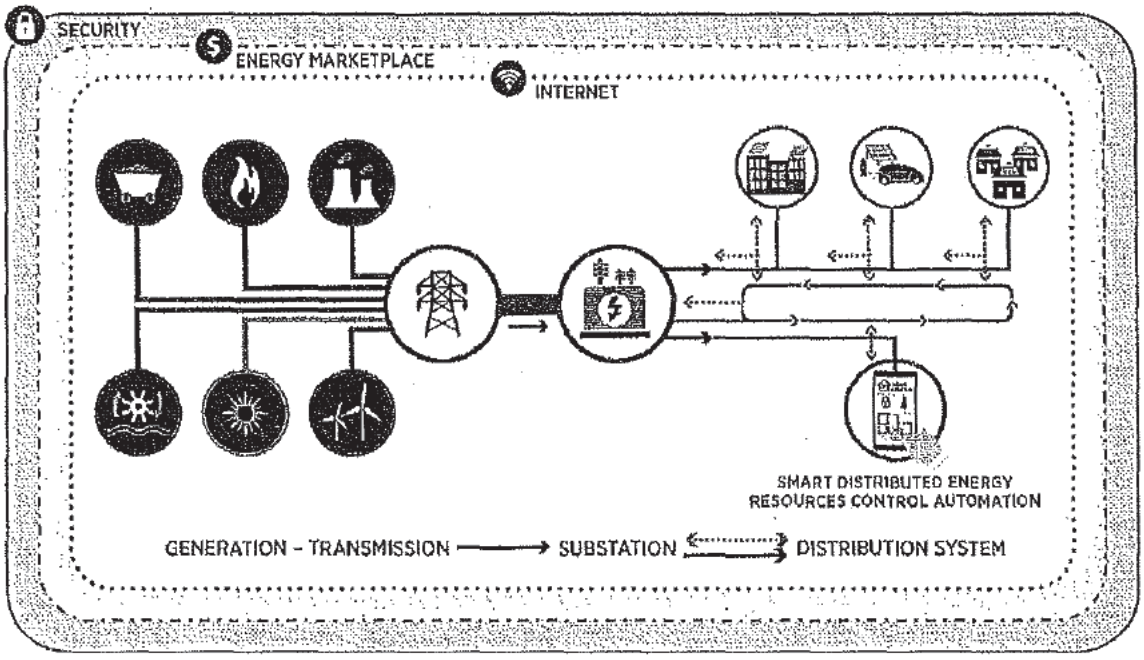


Figure 2: Illustration of high level solar penetration in a modernized electricity power system.

In this FOA the SETO Systems Integration subprogram seeks to fund research in the following topic areas:

- Adaptive Solar Grid Integration;
- Solar Observability;
- Solar + X; and
- Innovative Pathways.

Modernizing the grid also requires a workforce capable of understanding and managing this dynamic and digital environment. For those interested in developing proposals related to training the digital grid workforce of the future, please refer to Topic 4 of this FOA.

Topic 1.1 Adaptive Solar Grid Integration

This topic will support applications to research and field validate innovative technologies that enable distributed solar photovoltaic (PV) to contribute to grid reliability and resilience by providing solar dispatchability and grid-support functions—including energy, capacity, and reliability and resilience services. These technologies can be deployed throughout the electric distribution system. The approaches will focus on developing flexible interconnection requirements and dynamic hosting capacity concepts for solar PV as opposed to today's prevalent "firm" interconnection requirements and static hosting capacity planning. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs), Through the intelligent control of the distributed assets,

flexible interconnection requirements can increase the overall hosting capacity for solar and DERs in the distribution system, support diverse customer interconnection choices, improve system reliability and resilience, and reduce PV curtailment. Applications must consider diverse DER options (e.g. PV, energy storage, flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed technologies in the hosting capacity analysis. It should also be shown in these solutions how a fleet of PV systems from multiple customers at 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, control hardware and software innovations for smart PV inverters and DER management system (DERMS) that allow more flexibility to interconnection and operation of small scale PV and other DER systems.

Topic 1.2 Solar Observability

This topic will support applications to research, develop and validate observability or situational awareness technologies at the grid edge to support planning and operation with high PV penetration. Primary focus areas include PV-integrated sensor technologies, secure and robust communication, advanced data analytics (including machine learning) and detection of cyber-intrusion. Projects may also be considered with secondary focus areas, which enhance grid-edge observability of solar systems by integration with additional planning, operations and business unit systems. All applications should have an assessment of economic viability of the system or component in the application and as part of the project.

Topic 1.3 Solar + X

This topic will support applications to research and field validate innovative approaches to integrate Behind-the-Meter (BTM) solar PV with synergistic technologies (including but not limited to energy storage, building controls, demand response, electric vehicles, and other DERs) to support dispatchability and provide grid services – including energy, capacity, and reliability and resilience services – as a single control point. Projects will focus on research and development in control coordination and optimization of BTM customer-owned and co-located behind a single (master) meter: PV, storage, and other DER assets in response to broader system-wide conditions, with key interest in utilizing DER assets to provide critical power during outages. Projects may consider traditional "firm" DER interconnection requirements as well as emerging flexible interconnection approaches (such as those sought in Topic 1.1) and innovative compensation mechanisms. In an effort to minimize the overall system cost for solar integration arising from new hardware deployment, such as battery storage, , applicants are encouraged to consider how solar and load estimation, advanced data analytics, and artificial intelligence can be utilized in the operations of their proposed systems. All Applicants should have an assessment of economic viability of the system or component in the application as part of the project.

Topic 1.4 Innovative Pathways: Systems Integration

This topic will explore innovative approaches and models to accelerate the transfer of systems integration and related technologies from the lab into the real world. Rather than funding

research on individual technology solutions directly, applicants will research and develop new methods to advance research portfolios of solar (and related) technologies and overcome challenges endemic to the solar technology transfer space, including knowledge gaps between the research/industrial communities and constraints on access to necessary resources. Applicants must demonstrate a realistic pathway to test, scale and sustain the model after the period of performance. Potential areas of interest include, but are not limited to, models to deploy alternative capital (e.g., local public-private partnerships, foundations) for technology R&D or transfer, structures to incentivize industry-researcher collaboration, approaches to lower barriers such that new entrants can leverage existing facilities, data and build capacity (e.g., dormant manufacturing capacity or underutilized laboratory space), and methods to drive down the cost and accelerate processes around hardware validation and certification.

Rodriguez, Susan (CONTR)

Sent:	Thursday, July 26, 2018 2:41 PM
To:	Unruh, Timothy;Garson, Jennifer
Cc:	Yuan, Guohui;Gay, Charlie;Grosso, Matthew;Moreno, Alejandro
Subject:	FW: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions
Attachments:	1836 FOA - SMH_PSH - Mgmt Review - Topic 2.2.docx; DE-FOA-0001840_SETO_FY18 _FOA_TOPIC 1 Systems Integration.docx

Hi Tim,

In case it is helpful, a few more details are added in red below. We also wanted to remind you that we engaged with Katie and received her input on our workforce Topic 4.2: Digital Adaptation Training for Distributed Energy Resources on the Grid.

Also, there is a question as to (b) (5)
(b) (5) We will look to you for guidance after your meeting with Katie tomorrow afternoon.

Thank you,
Becca

From: Garson, Jennifer
Sent: Monday, July 23, 2018 8:42 PM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Moreno, Alejandro <Alejandro.Moreno@ee.doe.gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Grosso, Matthew <Matthew.Grosso@EE.DOe.Gov>
Subject: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions

Tim -

Per our discussion, in advance of the meeting on Friday, please find attached the Topic 2.2 for the Hydro FOA and the Solar Topic 1.

Per the offices, here is the status of the coordination with OE:

Solar Office

- SETO worked closely with Gil Bindewald (OE) on the subtopics and specific language of topic 1 of the FOA. Gil shared the topic language with Michael Pesin and Katie Jereza in late March. We did not hear any feedback.
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- SETO will be requesting OE to be part of the Federal Consensus Panel that recommends the selections for the FOA. That panel meets in late August.

Water Office

- Water Power Technologies Office / Hydropower Program has engaged OE on program-level development and strategy for the hydropower grid topics in this FOA.
    - For example, OE staff reviewed the hydropower RFI that issued in February; OE staff are a part of the informal DOE advisory group convened regularly to review current and planned activities including this FOA; and WPTO has made concerted outreach to OE staff to engage on strategy (Gil Bindewald).

- In addition, WPTO has spoken with OE staff on specific topics, including (b) (5)

    - Notably, WPTO director Alejandro Moreno and OE DAS Michael Pesin co-convened a briefing on July 11 to discuss the Energy Storage Program's storage valuation program, as the OE program has invested in economic analytical tools which are currently used by WPTO to evaluate pumped storage hydropower.
- WPTO will invite OE staff to participate in merit review of the FOA and intends to continue to brief OE staff for coordination.

Please let me know if you need any additional information.

Best,
Jenn

Jennifer Garson
Chief of Staff
Office of Deputy Assistant Secretary for Renewable Power
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
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WPTO Hydro FOA Topic 2.2

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

"Innovative Design Concepts for Standard Modular Hydropower and Pumped-Storage Hydropower"

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001836
FOA Type: Initial
CFDA Number: 81.087

	(b) (5)
FOA Issue Date:	
FOA Informational Webinar (Topic Areas 1 and 2):	
Standard Modular Hydropower Resources Webinar (Topic Area 1 Only):	
Submission Deadline for Concept Papers:	
Submission Deadline for Full Applications:	
Expected Submission Deadline for Replies to Reviewer Comments:	
Expected Date for EERE Selection Notifications:	
Expected Timeframe for Award Negotiations	

B. Topic Area 2 – New Use Cases for Pumped-Storage Hydropower

1. Background

Pumped storage hydropower comprises over 95% of the electrical energy storage in the United States today. Despite its significant contribution to grid-scale storage, new pumped storage hydropower plants are not being built in the U.S. Only one new pumped storage facility has been built since 1970, despite dramatic increases in storage supportive policies in the last ten years.[1] Existing pumped storage operations are shifting to adapt to new resources, market structures, demand patterns, and pricing signals.[2] Pumped storage technology in conventional configurations and uses (e.g. multi-hundred megawatt open- and closed-loop configurations) are complex, custom-designed civil engineering projects which may entail significant regulatory, cost, schedule, and geotechnical risks.

Critical limitations to new development include:

- **Certainty on return on investment:** It is not clear how to evaluate the revenue opportunities of a large storage asset on a forward basis. Establishing investment

[1] Cite Market Report for 1970 date, cite storage policy data.
[2] Reference Hydropower Vision, RFI responses, Market Report and PSH website

certainty over the lifetime of the asset is particularly difficult, compounded by the unpredictability evidenced by the rapid change in the electric system. Most utility and system planning timeframes are only about 20 years. In addition, pumped storage assets, due to their large generating and storage capacity, have the potential to influence market prices as price-makers rather than price-takers, which complicates how market operators interact with and take advantage of these assets. Modeling efforts for storage have advanced, and a recently established project within the Water Power Technologies Office will focus exclusively on improving the practice of valuation for pumped storage.

- **Length of time to commissioning:** The timeframe from site design to commissioning, including permitting, is over 10 years. This presents a significant competitive disadvantage to pumped storage, as the delay prevents developments from responding to a current system opportunity. The lack of certainty for return on investment is even further diminished by needing insight into long-term revenue streams beginning at least 10 years from project initiation. In comparison, provided the controls and communications are established, today's battery storage technologies can be sited and commissioned in less than a year.
- **High initial and total capital costs:** As the electricity system undergoes a transformation, grid-supporting technologies will be required. Supporting technologies on a bulk system scale with transmission-level commitments are evaluated and planned for, but rarely constructed. A portion of this challenge is structural: the significant upfront capital costs of very large supporting assets presents initiation risk and drives decisions toward incremental commitments. Over its lifetime, pumped storage assets may be very cost effective, but they still require substantial initial investment. To meaningfully drive down the total cost of pumped storage, technology and structural strategies must achieve reductions in the initial costs for project development.
- **Siting opportunity and available value streams:** The typically large scale of pumped storage technologies will push development toward large water bodies and locational coincidence of substations for interconnection opportunities. There are several other considerations to siting a pumped storage system that will affect costs and timelines, including environmental effects, scaled development, and integration with other infrastructure to access new revenues and benefits beyond traditional electricity revenues.

2. Description

To address the critical barriers mentioned above, Topic Area 2 explores new use cases for pumped storage hydropower that can improve electricity system resilience, reliability, and economics. Applicants are expected to propose innovative technology concepts, analysis, or enhanced modeling capabilities that define a new, updated role for pumped storage in the evolving electricity system in the United States.

This Topic Area is aligned with WPTO's new grid research initiative to focus investments on innovations which will optimize hydropower resources for a secure, sustainable,

cost-effective, and reliable electricity system, and responds to FY18 Congressional direction to offer a competitive funding opportunity for pumped storage hydropower. This Topic Area is also consistent with DOE's Beyond Batteries initiative, which drives technology beyond cost reductions toward improved performance and enhanced provision of services to the grid.

This Topic Area also builds on a previous FY2016 FOA, DE-FOA-0001455, which issued four awards for new pumped storage innovations that met specific technology characteristics, with the comparable goal of reducing pumped storage costs and timelines. The new emphasis in this FOA, however, is on an increase in value rather than a reduction in levelized costs.

WPTO is therefore soliciting applications for awards in two sub-topic areas:

- *Sub-topic 2.1 – Innovative conceptual designs for pumped storage systems*
- *Sub-topic 2.2 – Modeling and analyzing the role of pumped storage in asset and system optimization*

a. **Sub-topic 2.2: Modeling and Analyzing the Role of Pumped Storage in Asset and System Optimization**

This sub-topic will support analysis of the technical capabilities of pumped storage to improve electricity system resilience, reliability, and economic efficiency, or to improve the performance of other grid assets. For example, modeling enhancements or analysis could explore the ability of storage to support system-wide strategies to manage fast ramps or high peak loads or investigate operational connections between storage and other grid assets such as solar photovoltaic (PV) or wind energy.

Among the family of storage technologies available and pre-commercial today, pumped storage hydropower facilities have distinguishing attributes. Pumped storage is the only storage technology capable of operating at the transmission level. It is capable of generating energy over a substantial duration of time, of providing high-volume injection or absorption of electricity, and of providing a broad range of essential grid reliability services.

Constructed mostly in the 1960s and 1970s, existing pumped storage hydropower plants were originally designed and optimized for daily energy shifting – pumping water from a lower elevation reservoir to a higher elevation reservoir during low load hours and generating during high-load hours when electricity is in greatest demand – to support continuous and efficient operation of large thermal generation resources.

However, this business model is changing. Today, pumped storage hydropower plants across the country are shifting to new operational paradigms. For certain pumped storage facilities, price swings in the last five years have resulted in an inversion of the traditional pumping-generating pattern, now pumping during the day and generating at

night, as evidenced by the submissions to the WPTO's DE-FOA-0001886: Expanding Hydropower and Pumper Storage's Contribution to Grid Resiliency and Reliability Request for Information. In other instances, the timescale is fundamentally different. The traditional daily cycle of high- and low-load is no longer the primary operational driver; instead pumped storage hydropower is used for peak-shaving, intra-hour reliability requirements, or ramping.

If these trends continue, certain price and demand patterns are likely to emerge, some with significant consequences for large-scale storage. Projections from a recent study anticipate higher volatility in prices, very low value energy prices, higher premiums on flexibility and capacity, and inverse pricing spreads over the course of a day to a season. These changes may ripple effects beyond traditional procurement of electricity as energy, capacity, and ancillary services. For example, system operators may increasingly utilize pumped storage facilities as part of the transmission system, to manage transmission utilization and congestion. There are outstanding questions regarding about how well storage assets are afforded access to markets, given their unique operating characteristics, and under what circumstances a storage asset can provide both generation and transmission benefits without compromising market principles.

The optimal future role of pumped storage, both existing and proposed, is still not well-understood. Pumped storage assets can provide a broad range of benefits to the grid and to other assets, but a complete perspective of all of these benefits is rarely illustrated. Typically pumped storage benefits are evaluated at a portfolio-level for a specific purpose, such as transmission planning or resource adequacy over 10-20 years, which does not capture the full operational life (50-60 years) of a pumped storage plant. Capacity and transmission expansion models do not capture many of the services that pumped storage can provide and often overlook externalities. The analytical record is particularly shallow in evaluating pumped storage benefits to other grid assets, due in part to complexity and availability of comprehensive data.

In some instances, a complete perspective on value of pumped storage is limited by the lack of independent, real-world analyses that can be directly applied or used as reference cases. In others, the challenge is rooted in the current tools utilized within operations and planning practices. Models commonly employed in the electric power sector may not be well adapted to effective evaluation of pumped storage solutions, especially advanced technologies that permit even greater operational flexibility.

Technology innovations for pumped storage have focused on increasing plant flexibility with variable speed pumps and ternary (hydraulic bypass) systems. Proposed pumped storage developments may still be designed with fixed-speed pump design due to cost differential for the upgraded systems and uncertainty about the return on investment of utilizing the potential flexibility afforded by more innovative technologies. In addition, it is not clear whether the same technical benefits of flexibility can be achieved between

pumped storage plants and other mechanisms, such as an aggregation of smaller storage solutions or market expansion and design.

Therefore, to reduce the uncertainty regarding future investments and illustrate the value of storage at the bulk scale, this FOA invites applications for analyses and modeling enhancements that would collectively advance an understanding of the capabilities of pumped storage hydropower in electric system optimization or optimization of other grid assets, inclusive of generation and transmission.

This Sub-topic is intended to recruit applications for:

(1) Analyses that would illustrate to what extent, and in which cases, pumped storage hydropower can provide one or more specific material optimization benefits to electric system performance and/or other specific grid assets, or
(2) Modeling enhancements that would make the benefits of pumped storage hydropower more visible, more effectively analyzed, or possible within existing electric system operations and planning practices.

Applications in this sub-topic should evaluate the potential for pumped storage hydropower to provide one or more specific benefits that accrue either to the system or to other assets, in particular benefits that are currently not well understood. An application must articulate its additional value to the current state of knowledge, and make explicit any linkages to benefits to other grid assets. Example linkages include transmission utilization improvements, operating in tandem within the same control footprint, or an adjustment in the merit order (generating stack) that helps other plants operate more efficiently, reduces wear and tear on other machines, uses less fuel, or reduces environmental impacts. Applications should select a real system, rather than theoretical systems and assets, at a meaningful scale. Benefits should be measurable and linked to grid properties such as resilience, reliability, sustainability, or economic efficiency. Table 3 below outlines the requirements for proposed analyses.

Proposed modeling enhancements should address gaps in effective characterization of new advanced pumped storage or full utilization of pumped storage assets. Applications for modeling enhancements should use the gaps analysis provided in [Appendix F] as a guideline for focus areas with the greatest need and the greatest opportunity for impact. The proposed enhancement is not required to be open source in order to be eligible for award under this sub-topic. However, applications should strike a balance between two objectives: *impact* (that at the conclusion of the work, the enhancement will be used and useful) and *availability* (that others can access the enhancement and understand how well it works without excessive cost).

Applications for modeling enhancements should incorporate operations and planning entities that would take advantage of such enhancements as part of the project team. If the proposed work involves a new feature of an existing model under commercial license, applicants should include a demonstration of support or engagement with the

owner of that model. Applicants are strongly encouraged to incorporate partners and stakeholders into the proposed work beyond a demonstration of support.

Responsive applications will:

- Identify how the analysis or modeling enhancement meets the requirements established in Table 3 below or in modeling enhancements Appendix F;
- Demonstrate that the analysis or modeling enhancement would produce an innovative result or an innovative approach within the execution of the work;
- Propose work that will have a substantial, measurable impact on advancing an understanding of the full suite of benefits of pumped storage hydropower; and
- Propose a plan to disseminate the analysis or modeling enhancement to as wide an audience as possible (e.g., publication in the open literature, open source licensing, commercial licensing).

To gauge the extent to which modeling gaps are being addressed, WPTO intends to manage these projects as a portfolio, both in the selection process and during the period of performance. The portfolio of projects may include work being/to be performed at the National Labs and other entities.

Table 3: *Requirements for Proposed Analysis*

Data choice	Data should be appropriate for the work-product goals. For instance, analytical work that focuses on curtailment reduction should use load and variable generation forecasts and operating data that accurately capture curtailment challenges.
Project Team	Where an analysis would describe the optimization of an asset or a system, the project team should include the owner or operator of that asset or system, at minimum evidenced by a letter of support. Applicants are strongly encouraged to incorporate partners and stakeholders into the proposed work beyond a demonstration of support.
Benefits	Benefits must be measurable and linked to grid properties such as resilience, reliability, sustainability, or economic efficiency. For economic benefits, the results should clearly show the lasting value provided to all stakeholders – measured by net benefits such as lower electricity cost, efficient utilization of renewables and load, and others as applicable.
Assumptions and Definitions for Proposed Analysis	• Analyses should be representative of a real system, rather than theoretical systems and assets.

	• The analysis baseline should be representative of existing or expected near-term conditions (e.g., 2020 RPS-based generation mix). • Models used to represent variable generation (e.g., wind and PV solar) should be realistic in terms of generation mix as well as spatial and temporal accuracy (e.g., the variability is not over- or under-represented, plant siting does not skew the results). • The approach to generator retirement should be clearly stated (e.g., if additional generation is added to a model, is some of the existing generation retired, and if so, how were the retirement choices determined?). • The underlying generation mix assumptions for forward-looking grid representations should be clearly defined (e.g., scenario X captures 2030 RPS requirements, scenario Y increases the amount of renewable generation from the current 20% on an annual energy basis to 40%). • Where unexpected forced outages are used in the analysis or modeling efforts, the nature of the forced outage should be described (e.g., fixed in time and amplitude across scenarios or varies from scenario to scenario). • The relevant geographic region should be clearly defined along with the regions connections and reliance on surrounding systems. • The generation mix for the baseline and each scenario should be clearly identified by generation type (e.g., airframe-derivative, open cycle combustion turbines) and capacity. The generation mix of interconnected systems to the relevant region should also be reported. • The flexibility assumptions (e.g., ramp rate per minute as a percentage of rated capacity, minimum stable level, and start time) for each type (and size class, if applicable) of generation should be clearly stated. • The capacity reserve for the system (and each scenario or sensitivity) should be clearly stated. • Peak variable generation penetration should be reported both in terms of time of occurrence and percent of peak load. • The type of pumped storage hydropower technology should be clearly defined (synchronous, inverter-based, variable speed pumping, and so forth).

WPTO Hydro FOA Topic 2.2

i. Work to be Conducted

At the end of the period of performance:

- *Analysis*: Awardees will produce a detailed, written technical report that describes the project team, data inputs, methodological approach, tools and models utilized, results of the analysis, dissemination plans, challenges in executing the work, and remaining gaps. All projects awardees will present publicly-sharable results in-person to WPTO and involved national laboratories at project conclusion at a summit event.
- *Modeling enhancement: Awardees will produce a detailed written technical report that describes the modeling enhancement, its applicability and effect, dissemination and engagement, and remaining gaps. If the work is open-source, additional requirements for disposition of source code may apply. All applicants should anticipate provisions relating to Intellectual Property (IP) as part of award negotiation. All awardees will demonstrate the modeling enhancements in-person to WPTO and involved national laboratories at project conclusion.*

Solar FOA – Topic 1 – Systems Integration

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

Solar Energy Technologies Office (SETO)
FY2018 Funding Opportunity Announcement (FOA)

FOA Number: DE-FOA-0001840
CFDA Number: 81.087

FOA Issue Date:	April 17th, 2018
Submission Deadline for Letter of Intent (LOI):	May 4th, 2018, 3:00pm ET
Informational Webinar: Visit EERE exchange FOA description for details regarding webinar timing and registration	
Submission Deadline for Concept Papers: • Applicants must submit a Concept Paper by 3:00pm ET on the due date listed above to be eligible to submit a Full Application. Topic Areas 2.1 and 3.1 SIPS applications must resubmit their LOI again as a concept paper by the concept paper deadline above to clear an administrative software restriction of EERE Exchange.	May 9th, 2018, 3:00pm ET
Submission Deadline for Full Applications and SIPS Applications:	(b) (5)
Expected Submission Deadline for Replies to Reviewer Comments:	August 2nd, 2018, 3:00pm ET
Expected Timeframe for EERE Selection Notifications:	September 2018

Topic 1 Advanced Solar Systems Integration Technologies

The Systems Integration (SI) subprogram supports early-stage research and development that advances the reliable, resilient, secure and affordable integration of solar energy onto the U.S. electric grid. For more in-depth discussion of solar grid integration, please visit "Solar Grid Integration" https://energy.gov/eere/solar/downloads/technical-background-2018-seto-funding-opportunity-announcement.

In 2011, solar power comprised less than 0.1% of the U.S. electricity supply with an installed capacity of just 1.2 gigawatts (GW). Solar now supplies nearly 2% of the annual U.S. electricity demand[1] with an installed capacity of roughly 47 GWs[2], and is continuing to grow. According to U.S. Energy Information Administration (EIA), in some states and regions, solar represents up to

[1] U.S. Energy Information Administration (EIA), Electric Power Monthly with Data for November 2017, published in January 2018. https://www.eia.gov/electricity/monthly/current_month/epm.pdf

[2] Source: Solar Energy Industries Association (SEIA), http://www.seia.org/

15% of total annual electricity generation. Instantaneous solar generation can reach a much higher level, more than 40% in some cases.[3]

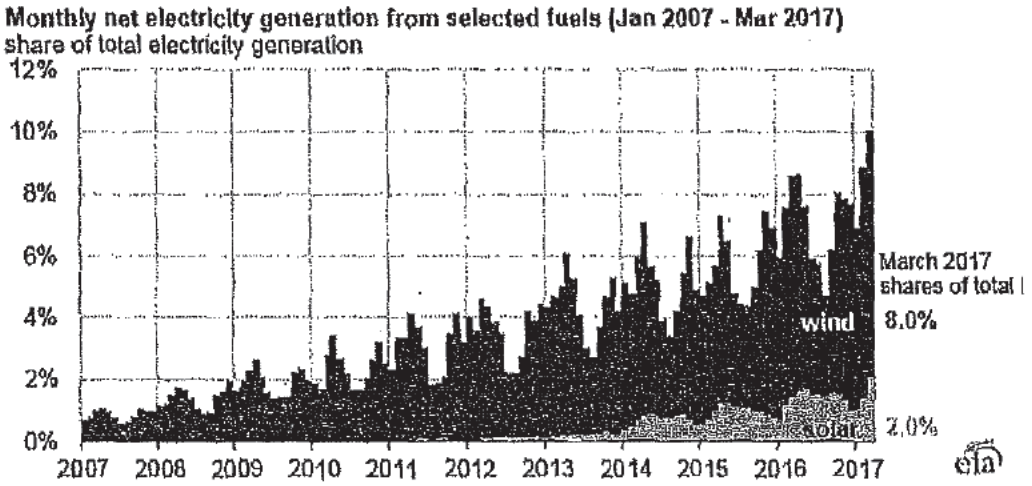


Figure 1: For the first time, in March 2017 solar supplied 2% of the U.S. electricity demand, while wind and solar combined accounted for 10% of the U.S. electricity generation. (Source: EIA)

As the penetration of solar energy on the grid continues to increase, it becomes imperative to identify the associated technical, economic and regulatory challenges, and to develop impactful solutions in order to ensure compatibility with the existing grid and a smooth transition to a secure, reliable and resilient grid of the future.

Traditional grid architecture was based on large-scale centralized generation remotely located from consumers, hierarchical control structures with minimal feedback, limited renewable generation such as wind and solar, limited energy storage and passive loads. A modern grid must be reliable, resilient and secure. It must have the ability to dynamically optimize grid operations and resources, rapidly detect and mitigate disturbances, engage millions if not billions more intelligent devices, integrate diverse generation sources (including both conventional and renewable types), integrate demand response and energy efficiency resources, enable customers to manage their electricity use and participate in markets, and provide strong protection against physical and cyber risks.

The current business-as-usual trajectory for the electric industry will not result in a timely transition to a modernized grid[4]. Since large investments in the past and today in the nation's electric grid infrastructure will remain in service for decades, it is important that the U.S. make

[3] For example, in the California Independent System Operator (CAISO) Monthly Renewables Performance Report, the 5-minute market data shows that at the maximum solar served almost 45% of the load in September 2017. See http://www.caiso.com/Documents/MonthlyRenewablesPerformanceReport-Nov2017.html

[4] Department of Energy Grid Modernization Multiyear Program Plan (MYPP)

smart decisions to invest in enabling and forward-looking technologies that will support the creation of a modern grid infrastructure in the coming years. There is a critical need to foster innovations and new technology adoptions by decreasing regulatory, market and business model uncertainties, demonstrating technology maturity and reducing implementation risks.

The Department of Energy's Grid Modernization Initiative[5], is a cross-cutting effort that aligns grid modernization efforts across the multiple DOE Program Offices. As part of the Grid Modernization Initiative (GMI), the SI subprogram supports targeted technology research and development (R&D) that addresses the technical challenges with achieving higher solar penetration, while supporting a safe, reliable, secure and cost-effective electric power system.

More broadly, the Grid Modernization Initiative focuses on the development of holistic solutions for the grid of the future. Several key technology areas have been identified in the Grid Modernization Multi-Year Program Plan (MYPP)[6]:

- Devices and Integrated Systems Testing;
- Sensing and Measurements;
- Systems Operations, Power Flow and Control;
- Design and Planning Tools;
- Security and Resilience; and
- Institutional Support.

Progress in all of these areas is considered crucial for the effective grid integration of solar energy and modernization of the grid, as illustrated in Figure 2. A specific focus of the SETO Systems Integration subprogram includes understanding the impacts of increasing penetration of solar energy on grid reliability and power quality, developing best practices for interconnecting and integrating solar with energy storage and synergistic technologies, addressing the variability of solar generation, researching power electronic technologies for flexible power flow control, enhancing situational awareness of solar generation at the grid edge and informing the standardization of interconnection, interoperability, and cybersecurity for PV and other distributed energy resources (DER) systems. Taking these all together, the goal is to advance the knowledge-base and the ability to integrate solar generation, at scale, into electric transmission and distribution systems in a cost-effective, secure, and reliable manner.

[5] Accessed 01 November 2017, https://energy.gov/under-secretary-science-and-energy/grid-modernization-initiative

[6] Department of Energy Grid Modernization Multiyear Program Plan (MYPP), Accessed 01 November 2017, https://energy.gov/downloads/grid-modernization-multi-year-program-plan-mypp

Solar FOA – Topic 1 – Systems Integration

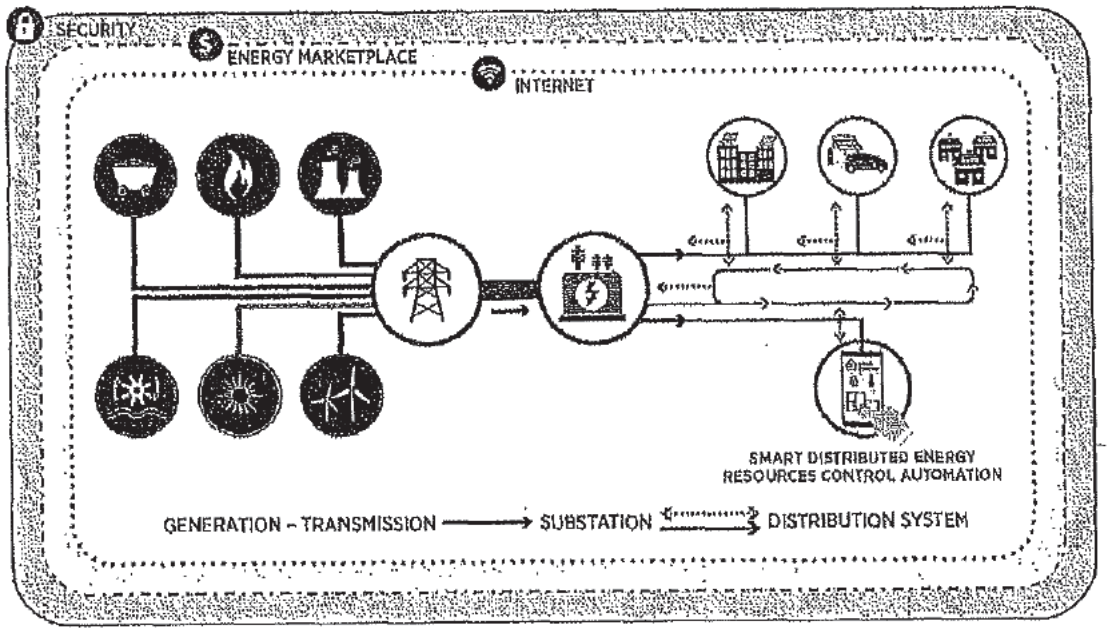


Figure 2: Illustration of high level solar penetration in a modernized electricity power system.

In this FOA the SETO Systems Integration subprogram seeks to fund research in the following topic areas:

- Adaptive Solar Grid Integration;
- Solar Observability;
- Solar + X; and
- Innovative Pathways.

Modernizing the grid also requires a workforce capable of understanding and managing this dynamic and digital environment. For those interested in developing proposals related to training the digital grid workforce of the future, please refer to Topic 4 of this FOA.

Topic 1.1 Adaptive Solar Grid Integration

This topic will support applications to research and field validate innovative technologies that enable distributed solar photovoltaic (PV) to contribute to grid reliability and resilience by providing solar dispatchability and grid-support functions—including energy, capacity, and reliability and resilience services. These technologies can be deployed throughout the electric distribution system. The approaches will focus on developing flexible interconnection requirements and dynamic hosting capacity concepts for solar PV as opposed to today's prevalent "firm" interconnection requirements and static hosting capacity planning. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs), Through the intelligent control of the distributed assets,

flexible interconnection requirements can increase the overall hosting capacity for solar and DERs in the distribution system, support diverse customer interconnection choices, improve system reliability and resilience, and reduce PV curtailment. Applications must consider diverse DER options (e.g. PV, energy storage, flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed technologies in the hosting capacity analysis. It should also be shown in these solutions how a fleet of PV systems from multiple customers at 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, control hardware and software innovations for smart PV inverters and DER management system (DERMS) that allow more flexibility to interconnection and operation of small scale PV and other DER systems.

Topic 1.2 Solar Observability

This topic will support applications to research, develop and validate observability or situational awareness technologies at the grid edge to support planning and operation with high PV penetration. Primary focus areas include PV-integrated sensor technologies, secure and robust communication, advanced data analytics (including machine learning) and detection of cyber-intrusion. Projects may also be considered with secondary focus areas, which enhance grid-edge observability of solar systems by integration with additional planning, operations and business unit systems. All applications should have an assessment of economic viability of the system or component in the application and as part of the project.

Topic 1.3 Solar + X

This topic will support applications to research and field validate innovative approaches to integrate Behind-the-Meter (BTM) solar PV with synergistic technologies (including but not limited to energy storage, building controls, demand response, electric vehicles, and other DERs) to support dispatchability and provide grid services – including energy, capacity, and reliability and resilience services – as a single control point. Projects will focus on research and development in control coordination and optimization of BTM customer-owned and co-located behind a single (master) meter: PV, storage, and other DER assets in response to broader system-wide conditions, with key interest in utilizing DER assets to provide critical power during outages. Projects may consider traditional "firm" DER interconnection requirements as well as emerging flexible interconnection approaches (such as those sought in Topic 1.1) and innovative compensation mechanisms. In an effort to minimize the overall system cost for solar integration arising from new hardware deployment, such as battery storage, , applicants are encouraged to consider how solar and load estimation, advanced data analytics, and artificial intelligence can be utilized in the operations of their proposed systems. All Applicants should have an assessment of economic viability of the system or component in the application as part of the project.

Topic 1.4 Innovative Pathways: Systems Integration

This topic will explore innovative approaches and models to accelerate the transfer of systems integration and related technologies from the lab into the real world. Rather than funding

research on individual technology solutions directly, applicants will research and develop new methods to advance research portfolios of solar (and related) technologies and overcome challenges endemic to the solar technology transfer space, including knowledge gaps between the research/industrial communities and constraints on access to necessary resources. Applicants must demonstrate a realistic pathway to test, scale and sustain the model after the period of performance. Potential areas of interest include, but are not limited to, models to deploy alternative capital (e.g., local public-private partnerships, foundations) for technology R&D or transfer, structures to incentivize industry-researcher collaboration, approaches to lower barriers such that new entrants can leverage existing facilities, data and build capacity (e.g., dormant manufacturing capacity or underutilized laboratory space), and methods to drive down the cost and accelerate processes around hardware validation and certification.

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Thursday, July 26, 2018 2:50 PM
To: Unruh, Timothy;Garson, Jennifer
Cc: Yuan, Guohui;Gay, Charlie;Grosso, Matthew;Moreno, Alejandro
Subject: FW: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions
Attachments: 1836 FOA - SMH_PSH - Mgmt Review - Topic 2.2.docx; DE-FOA-0001840_SETO_FY18 _FOA_TOPIC 1 Systems Integration.docx

Hi Tim,

A few more details are added in red below in case they are helpful. We also wanted to remind you that we engaged with Katie on our workforce FOA Topic 4.2: Digital Adaptation Training for Distributed Energy Resources on the Grid. She was briefed and provided feedback on an early draft of that topic, and we sent her team updates and the final version, though we didn't get further engagement in those later stages.

Last, we have a question about (b) (5)

We will look to you for guidance after your meeting tomorrow afternoon.

Thank you,
Becca

From: Garson, Jennifer
Sent: Monday, July 23, 2018 8:42 PM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Moreno, Alejandro <Alejandro.Moreno@ee.doe.gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Grosso, Matthew <Matthew.Grosso@EE.DOe.Gov>
Subject: SETO Topic 1 and WPTO Topic 2.2: OE Coordination and Topic Descriptions

Tim -

Per our discussion, in advance of the meeting on Friday, please find attached the Topic 2.2 for the Hydro FOA and the Solar Topic 1.

Per the offices, here is the status of the coordination with OE:

Solar Office

- SETO worked closely with Gil Bindewald (OE) on the subtopics and specific language of topic 1 of the FOA. Gil shared the topic language with Michael Pesin and Katie Jereza in late March. We did not hear any feedback.
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Please let me know if you need any additional information.

Best,
Jenn

Jennifer Garson
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Jennifer.Garson@ee.doe.gov | (202) 586-0082 (w) | (b) (6) (m)

WPTO Hydro FOA Topic 2.2

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Office of Energy Efficiency and Renewable Energy (EERE)

"Innovative Design Concepts for Standard Modular Hydropower and Pumped-Storage Hydropower"

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001836
FOA Type: Initial
CFDA Number: 81.087

FOA Issue Date:	(b) (5)
FOA Informational Webinar (Topic Areas 1 and 2):	
Standard Modular Hydropower Resources Webinar (Topic Area 1 Only):	
Submission Deadline for Concept Papers:	
Submission Deadline for Full Applications:	
Expected Submission Deadline for Replies to Reviewer Comments:	
Expected Date for EERE Selection Notifications:	
Expected Timeframe for Award Negotiations	

B. Topic Area 2 – New Use Cases for Pumped-Storage Hydropower

1. Background

Pumped storage hydropower comprises over 95% of the electrical energy storage in the United States today. Despite its significant contribution to grid-scale storage, new pumped storage hydropower plants are not being built in the U.S. Only one new pumped storage facility has been built since 1970, despite dramatic increases in storage supportive policies in the last ten years.[1] Existing pumped storage operations are shifting to adapt to new resources, market structures, demand patterns, and pricing signals.[2] Pumped storage technology in conventional configurations and uses (e.g. multi-hundred megawatt open- and closed-loop configurations) are complex, custom-designed civil engineering projects which may entail significant regulatory, cost, schedule, and geotechnical risks.

Critical limitations to new development include:

- **Certainty on return on investment:** It is not clear how to evaluate the revenue opportunities of a large storage asset on a forward basis. Establishing investment

[1] Cite Market Report for 1970 date, cite storage policy data.
[2] Reference Hydropower Vision, RFI responses, Market Report and PSH website

certainty over the lifetime of the asset is particularly difficult, compounded by the unpredictability evidenced by the rapid change in the electric system. Most utility and system planning timeframes are only about 20 years. In addition, pumped storage assets, due to their large generating and storage capacity, have the potential to influence market prices as price-makers rather than price-takers, which complicates how market operators interact with and take advantage of these assets. Modeling efforts for storage have advanced, and a recently established project within the Water Power Technologies Office will focus exclusively on improving the practice of valuation for pumped storage.

- **Length of time to commissioning:** The timeframe from site design to commissioning, including permitting, is over 10 years. This presents a significant competitive disadvantage to pumped storage, as the delay prevents developments from responding to a current system opportunity. The lack of certainty for return on investment is even further diminished by needing insight into long-term revenue streams beginning at least 10 years from project initiation. In comparison, provided the controls and communications are established, today's battery storage technologies can be sited and commissioned in less than a year.
- **High initial and total capital costs:** As the electricity system undergoes a transformation, grid-supporting technologies will be required. Supporting technologies on a bulk system scale with transmission-level commitments are evaluated and planned for, but rarely constructed. A portion of this challenge is structural: the significant upfront capital costs of very large supporting assets presents initiation risk and drives decisions toward incremental commitments. Over its lifetime, pumped storage assets may be very cost effective, but they still require substantial initial investment. To meaningfully drive down the total cost of pumped storage, technology and structural strategies must achieve reductions in the initial costs for project development.
- **Siting opportunity and available value streams:** The typically large scale of pumped storage technologies will push development toward large water bodies and locational coincidence of substations for interconnection opportunities. There are several other considerations to siting a pumped storage system that will affect costs and timelines, including environmental effects, scaled development, and integration with other infrastructure to access new revenues and benefits beyond traditional electricity revenues.

2. Description

To address the critical barriers mentioned above, Topic Area 2 explores new use cases for pumped storage hydropower that can improve electricity system resilience, reliability, and economics. Applicants are expected to propose innovative technology concepts, analysis, or enhanced modeling capabilities that define a new, updated role for pumped storage in the evolving electricity system in the United States.

This Topic Area is aligned with WPTO's new grid research initiative to focus investments on innovations which will optimize hydropower resources for a secure, sustainable,

cost-effective, and reliable electricity system, and responds to FY18 Congressional direction to offer a competitive funding opportunity for pumped storage hydropower. This Topic Area is also consistent with DOE's Beyond Batteries initiative, which drives technology beyond cost reductions toward improved performance and enhanced provision of services to the grid.

This Topic Area also builds on a previous FY2016 FOA, DE-FOA-0001455, which issued four awards for new pumped storage innovations that met specific technology characteristics, with the comparable goal of reducing pumped storage costs and timelines. The new emphasis in this FOA, however, is on an increase in value rather than a reduction in levelized costs.

WPTO is therefore soliciting applications for awards in two sub-topic areas:

- *Sub-topic 2.1 – Innovative conceptual designs for pumped storage systems*
- *Sub-topic 2.2 – Modeling and analyzing the role of pumped storage in asset and system optimization*

a. **Sub-topic 2.2: Modeling and Analyzing the Role of Pumped Storage in Asset and System Optimization**

This sub-topic will support analysis of the technical capabilities of pumped storage to improve electricity system resilience, reliability, and economic efficiency, or to improve the performance of other grid assets. For example, modeling enhancements or analysis could explore the ability of storage to support system-wide strategies to manage fast ramps or high peak loads or investigate operational connections between storage and other grid assets such as solar photovoltaic (PV) or wind energy.

Among the family of storage technologies available and pre-commercial today, pumped storage hydropower facilities have distinguishing attributes. Pumped storage is the only storage technology capable of operating at the transmission level. It is capable of generating energy over a substantial duration of time, of providing high-volume injection or absorption of electricity, and of providing a broad range of essential grid reliability services.

Constructed mostly in the 1960s and 1970s, existing pumped storage hydropower plants were originally designed and optimized for daily energy shifting – pumping water from a lower elevation reservoir to a higher elevation reservoir during low load hours and generating during high-load hours when electricity is in greatest demand – to support continuous and efficient operation of large thermal generation resources.

However, this business model is changing. Today, pumped storage hydropower plants across the country are shifting to new operational paradigms. For certain pumped storage facilities, price swings in the last five years have resulted in an inversion of the traditional pumping-generating pattern, now pumping during the day and generating at

night, as evidenced by the submissions to the WPTO's DE-FOA-0001886: Expanding Hydropower and Pumper Storage's Contribution to Grid Resliency and Reliability Request for Information. In other instances, the timescale is fundamentally different. The traditional daily cycle of high- and low-load is no longer the primary operational driver; instead pumped storage hydropower is used for peak-shaving, intra-hour reliability requirements, or ramping.

If these trends continue, certain price and demand patterns are likely to emerge, some with significant consequences for large-scale storage. Projections from a recent study anticipate higher volatility in prices, very low value energy prices, higher premiums on flexibility and capacity, and inverse pricing spreads over the course of a day to a season. These changes may ripple effects beyond traditional procurement of electricity as energy, capacity, and ancillary services. For example, system operators may increasingly utilize pumped storage facilities as part of the transmission system, to manage transmission utilization and congestion. There are outstanding questions regarding about how well storage assets are afforded access to markets, given their unique operating characteristics, and under what circumstances a storage asset can provide both generation and transmission benefits without compromising market principles.

The optimal future role of pumped storage, both existing and proposed, is still not well-understood. Pumped storage assets can provide a broad range of benefits to the grid and to other assets, but a complete perspective of all of these benefits is rarely illustrated. Typically pumped storage benefits are evaluated at a portfolio-level for a specific purpose, such as transmission planning or resource adequacy over 10-20 years, which does not capture the full operational life (50-60 years) of a pumped storage plant. Capacity and transmission expansion models do not capture many of the services that pumped storage can provide and often overlook externalities. The analytical record is particularly shallow in evaluating pumped storage benefits to other grid assets, due in part to complexity and availability of comprehensive data.

In some instances, a complete perspective on value of pumped storage is limited by the lack of independent, real-world analyses that can be directly applied or used as reference cases. In others, the challenge is rooted in the current tools utilized within operations and planning practices. Models commonly employed in the electric power sector may not be well adapted to effective evaluation of pumped storage solutions, especially advanced technologies that permit even greater operational flexibility.

Technology innovations for pumped storage have focused on increasing plant flexibility with variable speed pumps and ternary (hydraulic bypass) systems. Proposed pumped storage developments may still be designed with fixed-speed pump design due to cost differential for the upgraded systems and uncertainty about the return on investment of utilizing the potential flexibility afforded by more innovative technologies. In addition, it is not clear whether the same technical benefits of flexibility can be achieved between

pumped storage plants and other mechanisms, such as an aggregation of smaller storage solutions or market expansion and design.

Therefore, to reduce the uncertainty regarding future investments and illustrate the value of storage at the bulk scale, this FOA invites applications for analyses and modeling enhancements that would collectively advance an understanding of the capabilities of pumped storage hydropower in electric system optimization or optimization of other grid assets, inclusive of generation and transmission.

This Sub-topic is intended to recruit applications for:

(1) Analyses that would illustrate to what extent, and in which cases, pumped storage hydropower can provide one or more specific material optimization benefits to electric system performance and/or other specific grid assets, or
(2) Modeling enhancements that would make the benefits of pumped storage hydropower more visible, more effectively analyzed, or possible within existing electric system operations and planning practices.

Applications in this sub-topic should evaluate the potential for pumped storage hydropower to provide one or more specific benefits that accrue either to the system or to other assets, in particular benefits that are currently not well understood. An application must articulate its additional value to the current state of knowledge, and make explicit any linkages to benefits to other grid assets. Example linkages include transmission utilization improvements, operating in tandem within the same control footprint, or an adjustment in the merit order (generating stack) that helps other plants operate more efficiently, reduces wear and tear on other machines, uses less fuel, or reduces environmental impacts. Applications should select a real system, rather than theoretical systems and assets, at a meaningful scale. Benefits should be measurable and linked to grid properties such as resilience, reliability, sustainability, or economic efficiency. Table 3 below outlines the requirements for proposed analyses.

Proposed modeling enhancements should address gaps in effective characterization of new advanced pumped storage or full utilization of pumped storage assets. Applications for modeling enhancements should use the gaps analysis provided in [Appendix F] as a guideline for focus areas with the greatest need and the greatest opportunity for impact. The proposed enhancement is not required to be open source in order to be eligible for award under this sub-topic. However, applications should strike a balance between two objectives: *impact* (that at the conclusion of the work, the enhancement will be used and useful) and *availability* (that others can access the enhancement and understand how well it works without excessive cost).

Applications for modeling enhancements should incorporate operations and planning entities that would take advantage of such enhancements as part of the project team. If the proposed work involves a new feature of an existing model under commercial license, applicants should include a demonstration of support or engagement with the

owner of that model. Applicants are strongly encouraged to incorporate partners and stakeholders into the proposed work beyond a demonstration of support.

Responsive applications will:

- Identify how the analysis or modeling enhancement meets the requirements established in Table 3 below or in modeling enhancements Appendix F;
- Demonstrate that the analysis or modeling enhancement would produce an innovative result or an innovative approach within the execution of the work;
- Propose work that will have a substantial, measurable impact on advancing an understanding of the full suite of benefits of pumped storage hydropower; and
- Propose a plan to disseminate the analysis or modeling enhancement to as wide an audience as possible (e.g., publication in the open literature, open source licensing, commercial licensing).

To gauge the extent to which modeling gaps are being addressed, WPTO intends to manage these projects as a portfolio, both in the selection process and during the period of performance. The portfolio of projects may include work being/to be performed at the National Labs and other entities.

Table 3: *Requirements for Proposed Analysis*

Data choice	Data should be appropriate for the work-product goals. For instance, analytical work that focuses on curtailment reduction should use load and variable generation forecasts and operating data that accurately capture curtailment challenges.
Project Team	Where an analysis would describe the optimization of an asset or a system, the project team should include the owner or operator of that asset or system, at minimum evidenced by a letter of support. Applicants are strongly encouraged to incorporate partners and stakeholders into the proposed work beyond a demonstration of support.
Benefits	Benefits must be measurable and linked to grid properties such as resilience, reliability, sustainability, or economic efficiency. For economic benefits, the results should clearly show the lasting value provided to all stakeholders – measured by net benefits such as lower electricity cost, efficient utilization of renewables and load, and others as applicable.
Assumptions and Definitions for Proposed Analysis	• Analyses should be representative of a real system, rather than theoretical systems and assets.

	• The analysis baseline should be representative of existing or expected near-term conditions (e.g., 2020 RPS-based generation mix). • Models used to represent variable generation (e.g., wind and PV solar) should be realistic in terms of generation mix as well as spatial and temporal accuracy (e.g., the variability is not over- or under-represented, plant siting does not skew the results). • The approach to generator retirement should be clearly stated (e.g., if additional generation is added to a model, is some of the existing generation retired, and if so, how were the retirement choices determined?). • The underlying generation mix assumptions for forward-looking grid representations should be clearly defined (e.g., scenario X captures 2030 RPS requirements, scenario Y increases the amount of renewable generation from the current 20% on an annual energy basis to 40%). • Where unexpected forced outages are used in the analysis or modeling efforts, the nature of the forced outage should be described (e.g., fixed in time and amplitude across scenarios or varies from scenario to scenario). • The relevant geographic region should be clearly defined along with the regions connections and reliance on surrounding systems. • The generation mix for the baseline and each scenario should be clearly identified by generation type (e.g., airframe-derivative, open cycle combustion turbines) and capacity. The generation mix of interconnected systems to the relevant region should also be reported. • The flexibility assumptions (e.g., ramp rate per minute as a percentage of rated capacity, minimum stable level, and start time) for each type (and size class, if applicable) of generation should be clearly stated. • The capacity reserve for the system (and each scenario or sensitivity) should be clearly stated. • Peak variable generation penetration should be reported both in terms of time of occurrence and percent of peak load. • The type of pumped storage hydropower technology should be clearly defined (synchronous, inverter-based, variable speed pumping, and so forth).

i. Work to be Conducted

At the end of the period of performance:

- *Analysis*: Awardees will produce a detailed, written technical report that describes the project team, data inputs, methodological approach, tools and models utilized, results of the analysis, dissemination plans, challenges in executing the work, and remaining gaps. All projects awardees will present publicly-sharable results in-person to WPTO and involved national laboratories at project conclusion at a summit event.
- *Modeling enhancement: Awardees will produce a detailed written technical report that describes the modeling enhancement, its applicability and effect, dissemination and engagement, and remaining gaps. If the work is open-source, additional requirements for disposition of source code may apply. All applicants should anticipate provisions relating to Intellectual Property (IP) as part of award negotiation. All awardees will demonstrate the modeling enhancements in-person to WPTO and involved national laboratories at project conclusion.*

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

Solar Energy Technologies Office (SETO)
FY2018 Funding Opportunity Announcement (FOA)

FOA Number: DE-FOA-0001840
CFDA Number: 81.087

FOA Issue Date:	April 17th, 2018
Submission Deadline for Letter of Intent (LOI):	May 4th, 2018, 3:00pm ET
Informational Webinar: Visit EERE exchange FOA description for details regarding webinar timing and registration	
Submission Deadline for Concept Papers: • Applicants must submit a Concept Paper by 3:00pm ET on the due date listed above to be eligible to submit a Full Application. Topic Areas 2.1 and 3.1 SIPS applications must resubmit their LOI again as a concept paper by the concept paper deadline above to clear an administrative software restriction of EERE Exchange.	May 9th, 2018, 3:00pm ET
Submission Deadline for Full Applications and SIPS Applications:	(b) (5)
Expected Submission Deadline for Replies to Reviewer Comments:	August 2nd, 2018, 3:00pm ET
Expected Timeframe for EERE Selection Notifications:	September 2018

Topic 1 Advanced Solar Systems Integration Technologies

The Systems Integration (SI) subprogram supports early-stage research and development that advances the reliable, resilient, secure and affordable integration of solar energy onto the U.S. electric grid. For more in-depth discussion of solar grid integration, please visit "Solar Grid Integration" https://energy.gov/eere/solar/downloads/technical-background-2018-seto-funding-opportunity-announcement.

In 2011, solar power comprised less than 0.1% of the U.S. electricity supply with an installed capacity of just 1.2 gigawatts (GW). Solar now supplies nearly 2% of the annual U.S. electricity demand[1] with an installed capacity of roughly 47 GWs[2], and is continuing to grow. According to U.S. Energy Information Administration (EIA), in some states and regions, solar represents up to

[1] U.S. Energy Information Administration (EIA), Electric Power Monthly with Data for November 2017, published in January 2018. https://www.eia.gov/electricity/monthly/current_month/epm.pdf

[2] Source: Solar Energy Industries Association (SEIA), http://www.seia.org/

15% of total annual electricity generation. Instantaneous solar generation can reach a much higher level, more than 40% in some cases.[3]

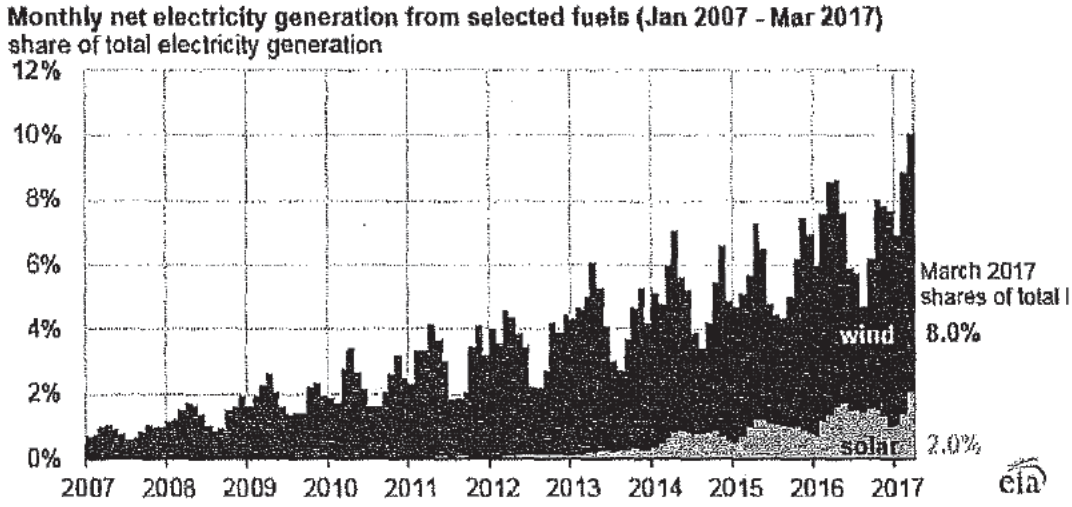


Figure 1: For the first time, in March 2017 solar supplied 2% of the U.S. electricity demand, while wind and solar combined accounted for 10% of the U.S. electricity generation. (Source: EIA)

As the penetration of solar energy on the grid continues to increase, it becomes imperative to identify the associated technical, economic and regulatory challenges, and to develop impactful solutions in order to ensure compatibility with the existing grid and a smooth transition to a secure, reliable and resilient grid of the future.

Traditional grid architecture was based on large-scale centralized generation remotely located from consumers, hierarchical control structures with minimal feedback, limited renewable generation such as wind and solar, limited energy storage and passive loads. A modern grid must be reliable, resilient and secure. It must have the ability to dynamically optimize grid operations and resources, rapidly detect and mitigate disturbances, engage millions if not billions more intelligent devices, integrate diverse generation sources (including both conventional and renewable types), integrate demand response and energy efficiency resources, enable customers to manage their electricity use and participate in markets, and provide strong protection against physical and cyber risks.

The current business-as-usual trajectory for the electric industry will not result in a timely transition to a modernized grid[4]. Since large investments in the past and today in the nation's electric grid infrastructure will remain in service for decades, it is important that the U.S. make

[3] For example, in the California Independent System Operator (CAISO) Monthly Renewables Performance Report, the 5-minute market data shows that at the maximum solar served almost 45% of the load in September 2017. See http://www.caiso.com/Documents/MonthlyRenewablesPerformanceReport-Nov2017.html

[4] Department of Energy Grid Modernization Multiyear Program Plan (MYPP)

smart decisions to invest in enabling and forward-looking technologies that will support the creation of a modern grid infrastructure in the coming years. There is a critical need to foster innovations and new technology adoptions by decreasing regulatory, market and business model uncertainties, demonstrating technology maturity and reducing implementation risks.

The Department of Energy's Grid Modernization Initiative[5], is a cross-cutting effort that aligns grid modernization efforts across the multiple DOE Program Offices. As part of the Grid Modernization Initiative (GMI), the SI subprogram supports targeted technology research and development (R&D) that addresses the technical challenges with achieving higher solar penetration, while supporting a safe, reliable, secure and cost-effective electric power system.

More broadly, the Grid Modernization Initiative focuses on the development of holistic solutions for the grid of the future. Several key technology areas have been identified in the Grid Modernization Multi-Year Program Plan (MYPP)[6]:

- Devices and Integrated Systems Testing;
- Sensing and Measurements;
- Systems Operations, Power Flow and Control;
- Design and Planning Tools;
- Security and Resilience; and
- Institutional Support.

Progress in all of these areas is considered crucial for the effective grid integration of solar energy and modernization of the grid, as illustrated in Figure 2. A specific focus of the SETO Systems Integration subprogram includes understanding the impacts of increasing penetration of solar energy on grid reliability and power quality, developing best practices for interconnecting and integrating solar with energy storage and synergistic technologies, addressing the variability of solar generation, researching power electronic technologies for flexible power flow control, enhancing situational awareness of solar generation at the grid edge and informing the standardization of interconnection, interoperability, and cybersecurity for PV and other distributed energy resources (DER) systems. Taking these all together, the goal is to advance the knowledge-base and the ability to integrate solar generation, at scale, into electric transmission and distribution systems in a cost-effective, secure, and reliable manner.

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[5] Accessed 01 November 2017, https://energy.gov/under-secretary-science-and-energy/grid-modernization-initiative

[6] Department of Energy Grid Modernization Multiyear Program Plan (MYPP), Accessed 01 November 2017, https://energy.gov/downloads/grid-modernization-multi-year-program-plan-mypp

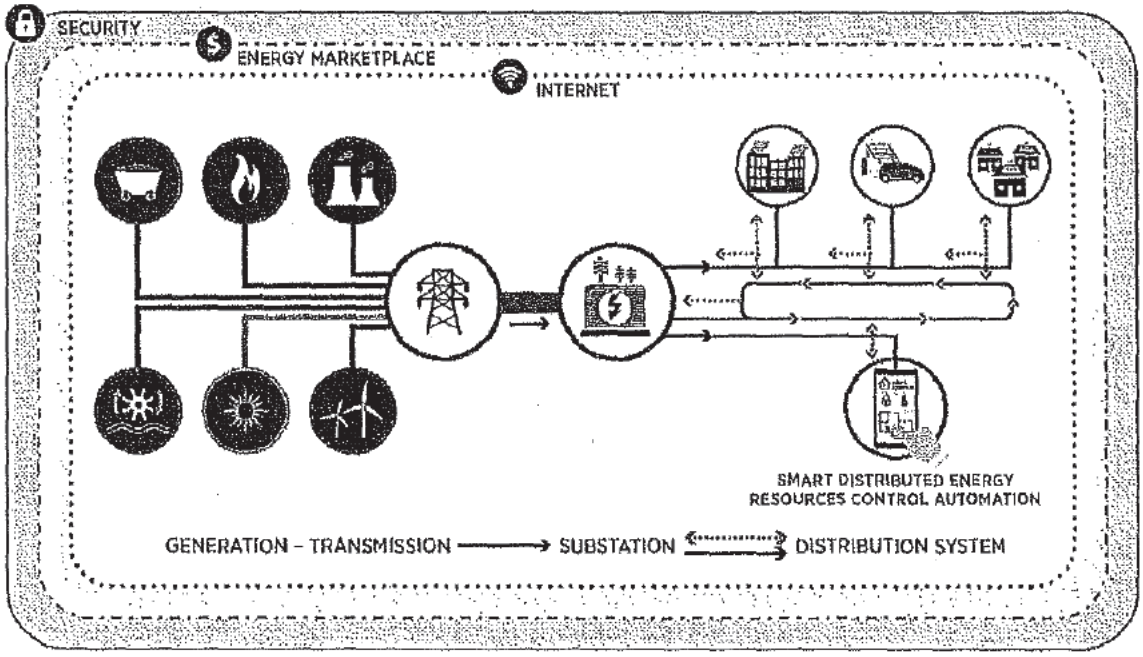


Figure 2: Illustration of high level solar penetration in a modernized electricity power system.

In this FOA the SETO Systems Integration subprogram seeks to fund research in the following topic areas:

- Adaptive Solar Grid Integration;
- Solar Observability;
- Solar + X; and
- Innovative Pathways.

Modernizing the grid also requires a workforce capable of understanding and managing this dynamic and digital environment. For those interested in developing proposals related to training the digital grid workforce of the future, please refer to Topic 4 of this FOA.

Topic 1.1 Adaptive Solar Grid Integration

This topic will support applications to research and field validate innovative technologies that enable distributed solar photovoltaic (PV) to contribute to grid reliability and resilience by providing solar dispatchability and grid-support functions—including energy, capacity, and reliability and resilience services. These technologies can be deployed throughout the electric distribution system. The approaches will focus on developing flexible interconnection requirements and dynamic hosting capacity concepts for solar PV as opposed to today's prevalent "firm" interconnection requirements and static hosting capacity planning. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs), Through the intelligent control of the distributed assets,

flexible interconnection requirements can increase the overall hosting capacity for solar and DERs in the distribution system, support diverse customer interconnection choices, improve system reliability and resilience, and reduce PV curtailment. Applications must consider diverse DER options (e.g. PV, energy storage, flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed technologies in the hosting capacity analysis. It should also be shown in these solutions how a fleet of PV systems from multiple customers at 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, control hardware and software innovations for smart PV inverters and DER management system (DERMS) that allow more flexibility to interconnection and operation of small scale PV and other DER systems.

Topic 1.2 Solar Observability

This topic will support applications to research, develop and validate observability or situational awareness technologies at the grid edge to support planning and operation with high PV penetration. Primary focus areas include PV-integrated sensor technologies, secure and robust communication, advanced data analytics (including machine learning) and detection of cyber-intrusion. Projects may also be considered with secondary focus areas, which enhance grid-edge observability of solar systems by integration with additional planning, operations and business unit systems. All applications should have an assessment of economic viability of the system or component in the application and as part of the project.

Topic 1.3 Solar + X

This topic will support applications to research and field validate innovative approaches to integrate Behind-the-Meter (BTM) solar PV with synergistic technologies (including but not limited to energy storage, building controls, demand response, electric vehicles, and other DERs) to support dispatchability and provide grid services – including energy, capacity, and reliability and resilience services – as a single control point. Projects will focus on research and development in control coordination and optimization of BTM customer-owned and co-located behind a single (master) meter: PV, storage, and other DER assets in response to broader system-wide conditions, with key interest in utilizing DER assets to provide critical power during outages. Projects may consider traditional "firm" DER interconnection requirements as well as emerging flexible interconnection approaches (such as those sought in Topic 1.1) and innovative compensation mechanisms. In an effort to minimize the overall system cost for solar integration arising from new hardware deployment, such as battery storage, , applicants are encouraged to consider how solar and load estimation, advanced data analytics, and artificial intelligence can be utilized in the operations of their proposed systems. All Applicants should have an assessment of economic viability of the system or component in the application as part of the project.

Topic 1.4 Innovative Pathways: Systems Integration

This topic will explore innovative approaches and models to accelerate the transfer of systems integration and related technologies from the lab into the real world. Rather than funding

research on individual technology solutions directly, applicants will research and develop new methods to advance research portfolios of solar (and related) technologies and overcome challenges endemic to the solar technology transfer space, including knowledge gaps between the research/industrial communities and constraints on access to necessary resources. Applicants must demonstrate a realistic pathway to test, scale and sustain the model after the period of performance. Potential areas of interest include, but are not limited to, models to deploy alternative capital (e.g., local public-private partnerships, foundations) for technology R&D or transfer, structures to incentivize industry-researcher collaboration, approaches to lower barriers such that new entrants can leverage existing facilities, data and build capacity (e.g., dormant manufacturing capacity or underutilized laboratory space), and methods to drive down the cost and accelerate processes around hardware validation and certification.

Rodriguez, Susan (CONTR)

From: Tripodi, Cathy
Sent: Monday, July 30, 2018 1:32 PM
To: Unruh, Timothy
Subject: RE: SETO Topic 1 and SETO Introduction - Materials for OE Review

Thank you

From: Unruh, Timothy
Sent: Monday, July 30, 2018 4:27 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>
Subject: SETO Topic 1 and SETO Introduction - Materials for OE Review

Attached is the document with the SETO FOA Topic 1, and, at the end of the document is the paste of the general introduction.

Thanks.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
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Deputy Assistant Secretary – Renewable Power
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Rodriguez, Susan (CONTR)

Sent:	Monday, July 30, 2018 1:36 PM
To:	Walker, Bruce;Lotto, Adrienne;Jereza, Catherine
Subject:	FW: SETO Topic 1 and SETO Introduction - Materials for OE Review
Attachments:	DE-FOA-0001840_SETO_FY18_FOA_TOPIC 1 Systems Integration.docx

From: Unruh, Timothy
Sent: Monday, July 30, 2018 4:27 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
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Deputy Assistant Secretary – Renewable Power
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Solar FOA – Topic 1 – Systems Integration

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[2] Source: Solar Energy Industries Association (SEIA), http://www.seia.org/

15% of total annual electricity generation. Instantaneous solar generation can reach a much higher level, more than 40% in some cases.[3]

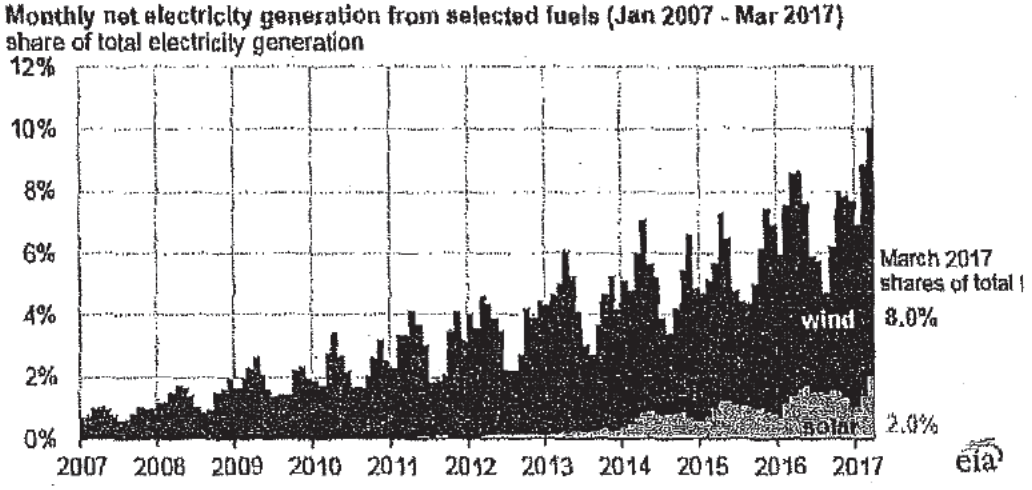


Figure 1: For the first time, in March 2017 solar supplied 2% of the U.S. electricity demand, while wind and solar combined accounted for 10% of the U.S. electricity generation. (Source: EIA)

As the penetration of solar energy on the grid continues to increase, it becomes imperative to identify the associated technical, economic and regulatory challenges, and to develop impactful solutions in order to ensure compatibility with the existing grid and a smooth transition to a secure, reliable and resilient grid of the future.

Traditional grid architecture was based on large-scale centralized generation remotely located from consumers, hierarchical control structures with minimal feedback, limited renewable generation such as wind and solar, limited energy storage and passive loads. A modern grid must be reliable, resilient and secure. It must have the ability to dynamically optimize grid operations and resources, rapidly detect and mitigate disturbances, engage millions if not billions more intelligent devices, integrate diverse generation sources (including both conventional and renewable types), integrate demand response and energy efficiency resources, enable customers to manage their electricity use and participate in markets, and provide strong protection against physical and cyber risks.

The current business-as-usual trajectory for the electric industry will not result in a timely transition to a modernized grid[4]. Since large investments in the past and today in the nation's electric grid infrastructure will remain in service for decades, it is important that the U.S. make

[3] For example, in the California Independent System Operator (CAISO) Monthly Renewables Performance Report, the 5-minute market data shows that at the maximum solar served almost 45% of the load in September 2017. See http://www.caiso.com/Documents/MonthlyRenewablesPerformanceReport-Nov2017.html

[4] Department of Energy Grid Modernization Multiyear Program Plan (MYPP)

smart decisions to invest in enabling and forward-looking technologies that will support the creation of a modern grid infrastructure in the coming years. There is a critical need to foster innovations and new technology adoptions by decreasing regulatory, market and business model uncertainties, demonstrating technology maturity and reducing implementation risks.

The Department of Energy's Grid Modernization Initiative[5], is a cross-cutting effort that aligns grid modernization efforts across the multiple DOE Program Offices. As part of the Grid Modernization Initiative (GMI), the SI subprogram supports targeted technology research and development (R&D) that addresses the technical challenges with achieving higher solar penetration, while supporting a safe, reliable, secure and cost-effective electric power system.

More broadly, the Grid Modernization Initiative focuses on the development of holistic solutions for the grid of the future. Several key technology areas have been identified in the Grid Modernization Multi-Year Program Plan (MYPP)[6]:

- Devices and Integrated Systems Testing;
- Sensing and Measurements;
- Systems Operations, Power Flow and Control;
- Design and Planning Tools;
- Security and Resilience; and
- Institutional Support.

Progress in all of these areas is considered crucial for the effective grid integration of solar energy and modernization of the grid, as illustrated in Figure 2. A specific focus of the SETO Systems Integration subprogram includes understanding the impacts of increasing penetration of solar energy on grid reliability and power quality, developing best practices for interconnecting and integrating solar with energy storage and synergistic technologies, addressing the variability of solar generation, researching power electronic technologies for flexible power flow control, enhancing situational awareness of solar generation at the grid edge and informing the standardization of interconnection, interoperability, and cybersecurity for PV and other distributed energy resources (DER) systems. Taking these all together, the goal is to advance the knowledge-base and the ability to integrate solar generation, at scale, into electric transmission and distribution systems in a cost-effective, secure, and reliable manner.

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[5] Accessed 01 November 2017, https://energy.gov/under-secretary-science-and-energy/grid-modernization-initiative

[6] Department of Energy Grid Modernization Multiyear Program Plan (MYPP); Accessed 01 November 2017, https://energy.gov/downloads/grid-modernization-multi-year-program-plan-mypp

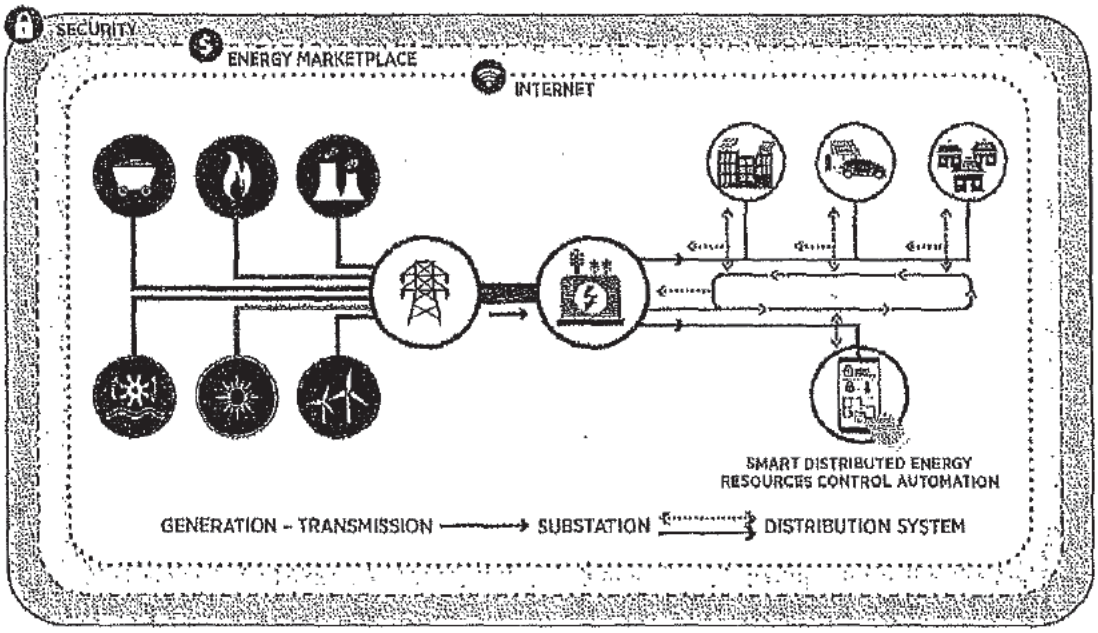


Figure 2: Illustration of high level solar penetration in a modernized electricity power system.

In this FOA the SETO Systems Integration subprogram seeks to fund research in the following topic areas:

- Adaptive Solar Grid Integration;
- Solar Observability;
- Solar + X; and
- Innovative Pathways.

Modernizing the grid also requires a workforce capable of understanding and managing this dynamic and digital environment. For those interested in developing proposals related to training the digital grid workforce of the future, please refer to Topic 4 of this FOA.

Topic 1.1 Adaptive Solar Grid Integration

This topic will support applications to research and field validate innovative technologies that enable distributed solar photovoltaic (PV) to contribute to grid reliability and resilience by providing solar dispatchability and grid-support functions—including energy, capacity, and reliability and resilience services. These technologies can be deployed throughout the electric distribution system. The approaches will focus on developing flexible interconnection requirements and dynamic hosting capacity concepts for solar PV as opposed to today's prevalent "firm" interconnection requirements and static hosting capacity planning. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs), Through the intelligent control of the distributed assets,

flexible interconnection requirements can increase the overall hosting capacity for solar and DERs in the distribution system, support diverse customer interconnection choices, improve system reliability and resilience, and reduce PV curtailment. Applications must consider diverse DER options (e.g. PV, energy storage, flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed technologies in the hosting capacity analysis. It should also be shown in these solutions how a fleet of PV systems from multiple customers at 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, control hardware and software innovations for smart PV inverters and DER management system (DERMS) that allow more flexibility to interconnection and operation of small scale PV and other DER systems.

Topic 1.2 Solar Observability

This topic will support applications to research, develop and validate observability or situational awareness technologies at the grid edge to support planning and operation with high PV penetration. Primary focus areas include PV-integrated sensor technologies, secure and robust communication, advanced data analytics (including machine learning) and detection of cyber-intrusion. Projects may also be considered with secondary focus areas, which enhance grid-edge observability of solar systems by integration with additional planning, operations and business unit systems. All applications should have an assessment of economic viability of the system or component in the application and as part of the project.

Topic 1.3 Solar + X

This topic will support applications to research and field validate innovative approaches to integrate Behind-the-Meter (BTM) solar PV with synergistic technologies (including but not limited to energy storage, building controls, demand response, electric vehicles, and other DERs) to support dispatchability and provide grid services – including energy, capacity, and reliability and resilience services – as a single control point. Projects will focus on research and development in control coordination and optimization of BTM customer-owned and co-located behind a single (master) meter; PV, storage, and other DER assets in response to broader system-wide conditions, with key interest in utilizing DER assets to provide critical power during outages. Projects may consider traditional "firm" DER interconnection requirements as well as emerging flexible interconnection approaches (such as those sought in Topic 1.1) and innovative compensation mechanisms. In an effort to minimize the overall system cost for solar integration arising from new hardware deployment, such as battery storage, , applicants are encouraged to consider how solar and load estimation, advanced data analytics, and artificial intelligence can be utilized in the operations of their proposed systems. All Applicants should have an assessment of economic viability of the system or component in the application as part of the project.

Topic 1.4 Innovative Pathways: Systems Integration

This topic will explore innovative approaches and models to accelerate the transfer of systems integration and related technologies from the lab into the real world. Rather than funding

research on individual technology solutions directly, applicants will research and develop new methods to advance research portfolios of solar (and related) technologies and overcome challenges endemic to the solar technology transfer space, including knowledge gaps between the research/industrial communities and constraints on access to necessary resources. Applicants must demonstrate a realistic pathway to test, scale and sustain the model after the period of performance. Potential areas of interest include, but are not limited to, models to deploy alternative capital (e.g., local public-private partnerships, foundations) for technology R&D or transfer, structures to incentivize industry-researcher collaboration, approaches to lower barriers such that new entrants can leverage existing facilities, data and build capacity (e.g., dormant manufacturing capacity or underutilized laboratory space), and methods to drive down the cost and accelerate processes around hardware validation and certification.

Solar FOA – Topic 1 – Systems Integration

A. Description/Background

This Funding Opportunity Announcement (FOA) is being issued by the U.S. Department of Energy's (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Solar Energy Technologies Office (SETO). This section describes the overall goals of SETO and the type of projects that are being solicited for funding support through this FOA.

In 2016, solar power surpassed 1% of annual electricity supply in the United States for the first time, and the Energy Information Administration projects that solar will grow to 5% of U.S. electricity by 2030.[7] Further, if the price of solar electricity and/or energy storage declines more rapidly than projected, that percentage could be even higher.[8] But solar is more than just a source of affordable electricity; it also provides the potential to improve grid reliability and resilience, increase employment ,[9] create business opportunities, increase energy diversity, and provide environmental benefits.

The mission of the Solar Energy Technologies Office (SETO) 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.

SETO focuses on two different solar energy technologies: photovoltaic (PV) technologies that directly convert sunlight into electricity, typically via a semiconductor, and concentrating solar thermal power (CSP) technologies that convert sunlight to heat, which can be converted or stored until needed, and then used to generate electricity or provide other energy services. Because sunshine varies with the time of day, location, and season, solar power systems must be paired with adaptive loads, other sources of power, or energy storage to deliver electricity whenever it's needed. This dependency reduces the value of solar power systems once solar starts to supply a significant fraction of the electricity within a given region and highlights the need for a focus on addressing grid integration challenges.

SETO, in partnership with other offices at DOE, launched the SunShot Initiative in February 2011 with the goal of solar electricity becoming price-competitive with

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[7] U.S. Department of Energy, Energy Information Administration, International Energy Outlook 2017, DOE/EIA-0484 (2017).

[8] P.A. Basore and W.J. Cole, "Comparing supply and demand models for future photovoltaic power generation in the USA," submitted to *Progress in Photovoltaics: Research and Applications*, 2017.

[9] The Solar Foundation, *National Solar Jobs Census*, 2010 – 2016.

conventional utility sources by 2020.[10] The SunShot 2020 goal has already been achieved for utility-scale PV, and with continued effort, it is likely to be achieved for grid-tied solar applications. As a result of this tremendous progress and in response to the growing deployment of solar in the U.S., SETO is increasing its focus on addressing the challenges related to seamlessly integrating high penetrations of solar energy onto the nation's electricity grid. Additionally, SETO set 2030 cost targets to further reduce the cost of solar electricity across all market sectors, which would make solar one of the most affordable sources of electricity and enable a substantial fraction of U.S. electricity demand to be supplied by solar technology.[11] The targets for the unsubsidized cost of electricity at the point of grid connection in a location with average U.S. solar resources are 3¢ per kilowatt-hour (kWh) for utility-scale photovoltaics, 4¢ per kWh for commercial rooftop photovoltaics, 5¢ per kWh for residential rooftop photovoltaics, and 5¢ per kWh for concentrating solar power with thermal energy storage.

By supporting early-stage research across the solar energy technology space through this FOA, SETO can foster innovation and enable integrated multi-technology solutions that can advance the widespread adoption of solar power while securely integrating it into the nation's energy grid.

Topic 1: Advanced Solar Systems Integration Technologies describes SETO research priorities in the seamless integration of high penetrations of solar energy onto the nation's electricity grid. Responsive projects would advance the prediction, monitoring, and control of solar power production, the capabilities of solar power electronics and the integration of solar energy with synergistic technologies.

Topic 2: Concentrating Solar Thermal Power Research and Development describes SETO research priorities that support solar technologies that focus sunlight to generate and store high-temperature heat for electricity generation and other end uses. Responsive projects would contribute to increasing solar power adoption and grid reliability often through combined power and storage.

Topic 3: Photovoltaic Research and Development describes SETO research priorities that support the further development of photovoltaic technologies that improve system reliability, annual energy yield, demonstrate performance of novel PV devices and develop new PV materials. Responsive projects would directly contribute to increasing PV affordability through continuous improvements in PV efficiency and reliability. SETO's work ensures that a pipeline of innovation continues to reduce PV system cost, increase power conversion efficiency, and reduce supply-chain capital expense.

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[10] *SunShot Vision Study*, NREL Technical Report DOE/GO-102012-3037, 2012.

[11] U.S. Dept. of Energy, *The SunShot Initiative's 2030 Goal: 3¢ per Kilowatt Hour for Solar Electricity*, 2016.

Solar FOA – Topic 1 – Systems Integration

Topic 4: Improving and Expanding the Solar Industry through Workforce Initiatives describes SETO research priorities that support solar workforce development. Responsive projects would focus on increasing the size of the pipeline of skilled workers being employed by the solar industry while simultaneously working to increase the participation of veterans and other talent pools, providing increased value to the solar industry as a whole.

SETO's funding supports U.S. leadership in solar technology R&D by funding the next generation of innovative technologies and by developing domestic research talent.

Historically, SETO has released separate funding opportunities that address specific stages and types of solar research. For the first time, this funding program combines SETO funding efforts into one FOA for fiscal year 2018 (FY2018). Subject to availability of funds appropriated by Congress for the purpose of this program, the availability of future-year budget authority, and approval, SETO intends to adjust topic descriptions and reopen this funding program for new applications each year relatively soon after budget guidance has been provided. By providing a more streamlined and consistent FOA strategy SETO hopes to further accelerate the advancement of solar research.

Rodriguez, Susan (CONTR)

From: Lotto, Adrienne
Sent: Monday, July 30, 2018 2:07 PM
To: Tripodi, Cathy;Walker, Bruce;Jereza, Catherine
Subject: RE: Update: Solar Transmission Grid FOA

Thanks Kathy. I will have Bruce review and get back to you shortly.

Adrienne Lotto

Chief of Staff for Office of Electricity (OE) and
Cybersecurity, Energy Security and Emergency Response (CESER)
1000 Independence Avenue, SW
Room 8H-033
Washington, DC 20585
Tel: (202) 586-1117

From: Tripodi, Cathy
Sent: Monday, July 30, 2018 4:44 PM
To: Walker, Bruce <Bruce.Walker@hq.doe.gov>; Lotto, Adrienne <Adrienne.Lotto@hq.doe.gov>; Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>
Subject: Update: Solar Transmission Grid FOA

HI Bruce, Adrian and Katie:

The solar office has offered to rewrite Topic 1 in their Solar FOA. While it is on the street, we can just do an amendment to change it. Katie and I had reviewed it with the solar Team and we did not understand it and so I was hoping that you all could rewrite it to achieve the grid integration consistent with OEs mission. Please see (b) (5)
and give me your suggested language as soon as you can. It is approximately $50 million.

Thank you,
Cathy T.

From: Tripodi, Cathy
Sent: Monday, July 30, 2018 3:11 PM
To: Walker, Bruce <Bruce.Walker@hq.doe.gov>; Lotto, Adrienne <Adrienne.Lotto@hq.doe.gov>; Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>
Subject: Solar Transmission Grid FOA

HI Bruce, Adrian and Katie:

There is approximately $50 million of a solar FOA that includes transmission grid matters. I think OE should have at least 3 people on the review panels. The dates needed for participation are:

(b) (5)

Independent Review Panel
Federal Consensus Panel Discussion

Thank you,
Cathy T.
X65050

From: Unruh, Timothy
Sent: Monday, July 30, 2018 3:02 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Cc: Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>; Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: Dates for Solar FOA review

There are two date periods we would like OE participation in for the Solar Program FOA Selection:

(b) (5)

Independent Review Panel
Federal Consensus Panel Discussion

Thanks.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982
15-16

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Wednesday, August 01, 2018 10:06 AM
To: Unruh, Timothy
Subject: RE: FOA language question

Thanks, Tim. Sounds then like it's anything related to grid integration at all, rather than specific approaches to that work...

-----Original Message-----
From: Unruh, Timothy
Sent: Wednesday, August 01, 2018 12:28 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>
Cc: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: RE: FOA language question

The best I know is everything under topic 1.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

-----Original Message-----
From: Jones-Albertus, Becca
Sent: Wednesday, August 01, 2018 11:05 AM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>
Cc: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: FOA language question

Hi Tim,

Would you be able to highlight (in the attachment) the specific language that is in question? It would be helpful to know the specific wording/topic(s), so we can be prepared for follow up.

Thank you!
Becca

Rodriguez, Susan (CONTR)

From: Gay, Charlie
Sent: Thursday, August 02, 2018 11:16 AM
To: Jones-Albertus, Becca
Subject: FW: FY18 SETO FOA - Deviation from Evaluation and Selection Plan
Attachments: EERE 101.1 FRD Part 2_0_signature review.docx

Hi Becca:

We should chat.

- Charlie
202-287-1987

From: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>
Date: Thursday, Aug 02, 2018, 2:13 PM
To: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>, Bobo, Diana <Diana.Bobo@ee.doe.gov>, Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Cc: Shultz, Avi <Abraham.Shultz@EE.Doe.Gov>, Kane, Victor <Victor.Kane@EE.Doe.Gov>
Subject: FY18 SETO FOA - Deviation from Evaluation and Selection Plan

Charlie, Diana, and Michael:

I am writing to request concurrence on a deviation to the Selection and Evaluation Plan for the FY18 SETO FOA (DE-FOA-0001840), per the language in the FOA Requirements Document (FRD) attached and copied/pasted below.

AFTER the Full Application due date: Any changes to Section II.B, Evaluation and Selection Process	The FOA Manager must immediately notify Director, Selection Official (if other than the Technology Office Director), CO, and Legal Counsel of the change, and obtain email approval and concurrence, as applicable. Depending on the nature of the change, additional discussion, documentation and further action may be necessary. All changes must be documented in the Merit Review Advisory Report (MRAR).

The requested change is to deviate from the requirement of having 3 or more Independent Reviewers for each Full Application. There are 25 CSP-SIPS applications to FOA Topic 2.1 that will be reviewed by only 2 independent reviewers (of a total 70 to That topic). The CSP team had a number of independent reviewers drop out of the review very late in the process. SETO staff was able to fill in some of the gaps, per guidance in the FRD, but was unable to achieve 3 reviews on each application. Per standard practice, all reviews will be scrutinized during the Federal Consensus Board meetings.

It is also worth noting that despite being the length of a Concept Paper and scoping out a relatively small research project, SIPS applications are submitted in EERE Exchange as "Full Applications" and in some instances they are treated as Full Apps in the FOA process (for example, in Section II. B. of the FRD where the reviewer requirement is laid out). In that section, the requirement for reviewers of Concept Papers in the is at least 2 reviewers (for reference).

I (FOA Manager) as well as Avi Shultz (CSP Program Manager and Federal Consensus Board member) support this decision. Please let me know if you have any questions.

Thank you,
Kyle

Kyle J Fricker, PhD
Solar Energy Technologies Office
U.S. Department of Energy
(202) 287-1909
kyle.fricker@ee.doe.gov

FOA Title	Solar Energy Technologies Office FY18 Funding Opportunity Announcement (SETO FOA)
FOA Number	DE-FOA-0001840
FOA Manager	Victor Kane

Key Steps for FRD Part 2:

1. FOA Manager is responsible for developing this document after Director has approved FRD Part 1.
2. When circulating this document to the FOA Team for review, include FRD Part 1 for reference.
3. FOA Manager is responsible for convening a FOA Strategy Meeting to review FRD Part 2 in accordance with the FOA SOP.
4. FOA Manager sends final, signed FRD Part 1 and Part 2 to FRD@ee.doe.gov.
5. If changes occur after Director, Selection Official (if other than the Technology Office Director), CO, and Legal Counsel sign this document, consult Section VII for required actions.

I. FOA Overview

For the FOA Description and Topic Areas, see FRD Part 1. Insert information from the FRD Part 1 "FOA Summary" table into the table below for easy reference by the FOA Team. If any of the fields below changed after FRD Part 1 was approved, highlight the change.

The table below describes SETOs recommendation for FOA topics depending on which funding scenario is provided. The cells are structured to show:

1. The expected total amount of funding allocated for the subtopic
    a. Note: The actual funding numbers per subtopic may be somewhat higher or lower depending on the number and quality of applications within each subtopic
2. The average expected amount for an individual award within that subtopic
    a. Note: Individual award amounts may be somewhat higher or lower than the expected amount depending on the scope of the project
3. The expected award duration for a project within that subtopic
    a. Note: Depending on the scope of the proposed project, some projects may have shorter durations, and in rare cases, longer durations
4. The expected number of awards that could be made for the subtopic
    a. Note: The actual number of awards per subtopic will depend on the number and quality of applications within each subtopic

All funds are FY18 dollars except for $1M of FY17 funding in Topic 4.1.

	Topic Title	Request ($2M)	House Mark ($21M)	Senate Mark ($80M)	Full Year CR ($105M)
TOPIC 1: Adaptive Local Grids, Advanced Systems Integration Technologies (20% cost share, TRL 2-5)					
Topic 1.1	Adaptive Local Grids	(b) (5)			
Topic 1.2	Solar Observability	X	X	(b) (5)	

				(b) (5)
Topic 1.3	Solar + X	X	X	
Topic 1.4	Innovative Pathways: Systems Integration	X	X	
Topic 2: Concentrating Solar Power Research and Development (20% cost share, TRL 2-5)				
Topic 2.1	Small Innovative Projects in Solar (SIPS): Concentrating Solar Power	X	(b) (5)	
Topic 2.2	Advanced CSP Collectors	X	X	(b) (5)
Topic 2.3	Advanced Power Cycles for CSP			
Topic 2.4	Advanced CSP Thermal Transport System and Components			
Topic 2.5	Innovative Pathways: Concentrating Solar Power	X	(b) (5)	
Topic 3: Photovoltaics Research and Development (20% cost share, TRL 2-5)				
Topic 3.1	Small Innovative Projects in Solar (SIPS): Photovoltaics	X	(b) (5)	
Topic 3.2	Increasing Affordability, Reliability, and Manufacturability of PV Cells, Modules, and Systems	X	X	(b) (5)
Topic 3.3	Collaborative Cross-Cutting PV Research			
Topic 3.4	Innovative Pathways: Photovoltaics	X	X	
Topic 4: Improving and Expanding the Solar Industry through Workforce Initiatives (No cost share, Education and Outreach)				
Topic 4.1	Increasing Inclusion in the Solar Workforce	X	(b) (5)	
Topic 4.2	Digital Adaptation in Power Systems through Workforce Initiatives	X		

* (b) (5)

Explain the rational for choosing the proposed TRL and, if applicable, how this TRL supports early stage research:

The TRL level will be between 2-5. SETO works in coordination with the Office of Science, which primarily focuses on TRL 1 work. Development through TRL 4-5 is necessary in order to ensure relevance of the early-stage technologies and to allow for validation testing that provides critical feedback to the research cycle.

Anticipated funding for evaluation and selection process: (b) (5)

II. FOA Approach

Some of the options below require context and explanation. In these cases, the check box will indicate if additional information is required. Bold/underline indicates EERE policy or best practice.

A. FOA Development	
1. Eligibility	Will the standard EERE eligibility language (see FOA template) be used? If not, an approved Determination of Restricted Eligibility is required (consult Legal Counsel). ☐ **Yes, standard EERE eligibility language applies (strongly encouraged). The standard EERE eligibility language cannot be modified, except where there is an approved DRE.** ☒ No, describe the proposed eligibility restriction and why the restriction is needed (*If DRE will only apply to some topic areas, note that here*): The only restriction is that DOE/NNSA FFRDC cannot be prime recipients; they can be sub recipients. This is to minimize opportunities for redundancy with FY18 AOP work and to provide greater predictability to laboratories on future funding levels.
2. FFRDC Participation (selections made here do not require DRE)	DOE/NNSA FFRDCs/National Laboratories can participate as: ☐ Prime Recipient or Subrecipient ☒ Subrecipient Only What limitations will the FOA place on FFRDCs proposed as subrecipients? ☒ FFRDC scope of work may not be more significant than the Prime Applicant's (as measured by proportion of total project costs proposed) ☐ FFRDC effort, in aggregate, shall not exceed [Enter Amount]% of the total estimated cost of the project ☐ FFRDC effort will not be limited
3. Number of Submittals per Applicant	How many Concept Papers may an applicant submit? ☒ No limit ☐ One ☐ One per topic area ☐ N/A How many Full Applications may an applicant submit? ☒ No limit, provided that each application describes a unique, scientifically distinct project ☐ One ☐ One for each topic area of this FOA

4. Award Funding	When will funding for awards be obligated? ☒ **Obligate all funding at the time of award** ☐ Obligate some funding up front, with remainder funded from future fiscal years (requires 301 notice). Describe why:
5. Cost Share	What percentage of cost share is required? Statutory: ☒ 0% Education/Outreach ☒ 20% R&D ☐ 50% Demonstration ☐ Higher cost share than the statutory minimum, describe what and why: ☐ FOA-specific cost share waiver (see process in EERE 101.4), describe why: ☐ Other, describe:
6. Notice of Intent	Will a Notice of Intent (NOI) to publish the FOA be issued? ☐ **Yes** ☒ No, describe why: FOA will be completed so will release as soon as approval is given.
7. Letters of Intent	Will Letters of Intent be used? ☐ **No** ☒ Yes
8. Down-select	Will a down-select process be utilized (to narrow the field of funded projects after a specified budget period)? ☒ No ☐ Yes, describe why a down-select is desired for projects resulting from this FOA:
9. Special Reporting	Will any special reports or data collection be required during or after the project period, beyond the standard reports from the Federal Assistance Reporting Checklist template? ☒ No ☐ Yes, describe requirements and reason for including special reports (e.g., monthly reporting, special database/repository, FTR draft 60 days prior period of performance end date, etc.):
10. Third Party Validation of Award Progress	Will a third party firm (e.g., engineering firm) be hired to assess technical progress of projects (e.g., to inform a go/no-go review)? ☒ No ☐ Yes, describe why:

11. Foreign Travel	Will foreign travel be allowed? ☐ No ☒ Yes, describe why: Solar technology projects may require foreign travel to complete approved scope.

B. Evaluation and Selection Process

The EERE Standard Evaluation and Selection Plan (E&S Plan) provides the standard processes to be followed for the evaluation and selection process for competitively selected financial assistance awards. The E&S Plan includes options for certain steps. The section below documents how the technology office intends to implement the evaluation and selection process for a specific FOA, including the selected options.

1. Selection Official	Who will serve as Selection Official? ☒ **Director of responsible Technology Office** ☐ Other, describe who and why:
2. Concept Papers	Will Concept Papers be used? ☒ **Yes** ☐ No
If not using Concept Papers, skip to question 7.	
3. Reviewers *(Concept Papers)*	Will a minimum of 2 reviewers be assigned to each Concept Paper? ☒ **Yes** ☐ No, describe why: What type of reviewers will be used for Concept Papers? Check all that apply. ☒ **Federal Employees and/or Contractors (includes Fellows) from within DOE** ☒ Other, describe who and why: external reviewers may be required due to a high number of applications
4. Review Criteria *(Concept Papers)*	Will the standard EERE Concept Paper Review Criteria (see FOA template) be used? ☐ Yes ☒ No, tailored criteria will be developed and published in the FOA
5. Scoring *(Concept Papers)*	How will reviewers score Concept Papers? *Note: The Concept Papers must be evaluated against the Concept Paper Technical Review Criteria published in the FOA.* ☒ **Scale of -1, 0, and 1** (see Standard EERE Evaluation and Selection Plan) ☐ Other, describe scoring method and rationale:

6. Comments *(Concept Papers)*	Will Concept Papers comments be made available to applicants (e.g., via EERE Exchange)? ☐ No ☒ Yes. *Note: The FOA Manager is responsible for ensuring comments are scrubbed for inappropriate remarks before releasing them to applicants and that the comments are not stated in manner that could give the appearance of providing an applicant with a competitive advantage.* Concept Paper Reviewers will be instructed to use the following parameters for their comments (check all that apply): ☒ Free form comments will be targeted to: 3 paragraph(s) per criterion ☐ Comments cannot exceed *[x]* total pages of comments per Concept Paper ☐ Other (describe):
7. Independent Reviewers *(Full Applications)*	How many reviewers will be assigned to each Full Application? *Note: At least 2 of the 3 reviewers must be (1) qualified reviewers from the private sector, such as industry or academia; or (2) qualified Federal employees not working in the responsible Technology Office.* ☒ 3 or More ☐ Less than 3, describe why:
8. Review Criteria *(Full Applications)*	Will the standard EERE Full Application Technical Review Criteria (see FOA template) be used? ☐ Yes ☒ No, tailored criteria will be developed and published in the FOA
9. Scoring *(Full Applications)*	How will reviewers score Full Applications? *Note: The Full Applications must be evaluated against the Full Application Technical Review Criteria published in the FOA.* ☐ Scale of 1-10 (see Standard EERE Evaluation and Selection Plan) ☒ Other, describe scoring method and rationale: 1-8, past experience shows the 1-10 scale is often used as an academic scale (A=100-90, B=90-80, C=80-70, etc) this skews results and makes the scoring less useful. By using a new scale the whole range will be used.
10. Comments *(Full Applications)*	How will you make comments available to Applicants on Full Applications? Must use at least one of the following methods (check applicable box(es)): ☒ Reply to Reviewer Comments process ☒ Federal consensus comments. Describe when the consensus comments will be sent to the applicants (e.g., Federal Consensus comments will be provided during the Reply Reviewer phase in lieu of independent reviewer comments or with the selection decision): sent with final selection decision ☐ Independent reviewer comments will be sent to applicants with the selection decision

11. Special Purpose Reviews *(Full Applications)*	Will Special Purpose Reviews of Full Applications be conducted (e.g., financial viability, NEPA, U.S. Manufacturing Plan)? ☒ No ☐ Yes, describe why and who will be used to conduct the review (reminder that all reviewers must sign the COI/NDA form): Will a third party firm (e.g., engineering firm) be used in the evaluation and selection process? ☒ No ☐ Yes, describe proposed approach and why a third party firm will be used:
12. Independent Review Meeting	Will Independent Reviewers be convened to discuss Full Applications (but not engage in a consensus decision-making process to avoid violations of Federal Advisory Committee Act)? ☒ Yes, in person ☐ Yes, by phone ☐ Yes, other method (describe): ☐ No, describe why: Will each reviewer be provided with access to Replies to Reviewer Comments, if applicable, at least 48 hours in advance of the meeting? ☒ Yes ☐ No, describe why:

13. Pre-Selection Interviews, Site Visits	Will Pre-Selection Interviews or site visits be conducted with applicants? ☐ No ☐ Yes, will follow the process in the Standard EERE Evaluation and Selection Plan ☒ Yes, the pre-selection interview process stated in the Standard EERE Evaluation and Selection Plan will be modified in the following manner: we will use the process followed in prior FOAs. Questions will be sent in advance and a phone call (for clearifications) or webinar/site visit (for interviews) will be held. Additional clarifying questions maybe asked in real time based on what is provided as a response to the initial questions. A standard set of questions will not be developed as the projects will differ. The CO and/or GMS can attend the calls/interviews. There will not be a 48 hour response period requirement, Applicants may be called directly or schedule ASAP. **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. **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. 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. As an 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. More than one preselection clarification call/webinar/meeting may be needed to retire all required clarifications. Decisions to hold pre-selection interviews and which list of applicants that will have the opportunity to interview must be cleared through the CO with concurrence from Legal and approved by the Selection Official before interviews are scheduled.
14. Federal Consensus Board	The Federal Consensus Board (FCB) should consist of at least three (3) members. Will the FCB consist of at least 3 members? ☒ Yes ☐ No, describe why: A Federal employee should not serve on both the Federal Consensus Board and as Independent Reviewer. Will members of the Federal Consensus Board be prohibited from participating as Independent Reviewers for this FOA? ☒ Yes ☐ No, describe why:
15. Program Policy Factors	Will the standard EERE program policy factors (see FOA template) be used? ☐ Yes **(with a tailored PPF for diversity)** ☒ No, tailored PPFs will be developed and published in the FOA

16. Other Changes	Will the Standard EERE Evaluation and Selection Plan be changed in any other manner not captured above? ☐ No ☒ Yes, describe: Given this FOA will have both technical and non-technical applications a flexible set of scoring criteria has been developed that works well for all types of projects. Concept papers and SIPS applications will be evaluated using 2 of the three technical review criteria that are used for Full Application evaluation. Specifically Criteria 1 (Innovation and Impact) and Criteria 3 (Capability and Resources of the Applicant/Project Team) each of these two criteria will be weighted at 50%. Please see the following section for a list of those criteria. All sub-criteria are of equal weight. Given the sheer number of applications that may come in for this FOA and the low number of selections only the legally required application document will be required at the time of application. Specifically, the project narrative (with summary SOPO as part of the Narrative), a SF424 (which includes high level budget numbers), the SF-LLL, and a summary PPT slide (not legally required but very helpful for the review). In addition a US manufacturing plan will also not be part of the initial full application submission and will be requested during the interview phase. All documents required for award processing will be requested during the negotiation process. This process was used in the recent strategic programs Innovative Pathways FOA and worked very well. Each sub-topic area will be reviewed and scored separately and produce separate waterfall charts and meritorious lines for each sub-topic. Scores will not be aggregated into one large waterfall chart. Given the sheer number of applications that may come in for this FOA the FOA manager may delegate responsibilities to FOA subtopic managers to avoid significant delays. For example a subtopic manager may handle a compliance review for their subtopic which the FOA manager will oversee. There will be a single MRAR produced for this FOA. Some Subtopics may utilize external reviewers for concept papers and some may not. Minimum number of review requirements will be met (2 for concept papers and 3 for full applications), however, it is often the case that some reviewers are unable to complete all of their reviews. In order to limit major delays, qualified office employees may be used to replace uncompleted reviews. Initial reviewer assignments may contain more than one SETO office employee; replacement reviews may contain more than one SETO office employee with the relevant knowledge and experience.

	Given the number of subtopics, each subtopic may be comprised of a separate grouping of at least 3 federal consensus board (FCB) members. Each sub topic will make recommendations for selection by topic area and the selection official will make a final determination of what to select. Given this, almost every Federal Employee with a technical background will be part of the FCB. In order to run this FOA, FCB members will need to also be able to perform independent reviews if needed (for example when a reviewer does not complete their review). Federal consensus members are permitted to ask clarifying questions during the merit review meeting. They require the best possible information to make recommendations to the selection official. A 'two line' process will be used to determine who will be interviewed. First a line will be drawn to determine the meritorious applications. A second line may or may not be drawn that designates applicants that will be selected without requiring an interview (exceptionally good applications). The Selection official will be provided with a preselection briefing of full application results and the list of applicants that will be interviewed (based on the first federal consensus review meeting) and provides approval. After the interviews conclude a second federal consensus meeting will be held to allow final consensus scores to be completed Federal consensus score changes will not be input into exchange (this would be a massive undertaking for little value), the changes will be completed in an excel sheet along with documentation for the reason for the change, and will be included in the MRAR. Final consensus comments may or may not be provided to applicants depending on the number of applications received and staff bandwidth. Small and Innovative Projects (SIPS) – SETO will continue to implement the SIPS process developed under the PVRD FOA. These projects are small (<$500K) and a single year in duration. Therefore a lengthy full application is not needed. To be considerate of the applicants time SETO will allow the SIPS applicants to utilize the 'concept paper' application format and submit during the full application stage. EERE exchange is able to do this by: (1) requiring SIPS applicants to submit a mandatory letter of intent during the letter of intent stage. (2) Requiring the SIPS applicant log back in and resubmit the letter of intent as a 'concept paper.' (3) Directing SIPS applicants to follow the concept paper format and submit as a 'full application.' This process has been used successfully in the past. The FOA reflects the above process
17. Certification	The Technology Office will follow the Standard EERE Evaluation and Selection Plan, subject to the modifications noted above. ☒ Yes (no other options allowed)

1

III. Legal Issues

A. Identify any legal issues to discuss with the assigned attorney not addressed in previous section.

B. Identify DOE's programmatic statutory authority to carry out the activities in the FOA (e.g., EPAct 2005, Section 931(a)(2)(A)(iii), as codified at 42 U.S.C. 16231(a)(2)(A)(iii)).
Note: Consult with Legal Counsel. This is different than the FRD Part 1 question, which asks if the FOA is statutorily required, but may include the same legal citation.

The programmatic authorizing statute is EPACT 2005, Section 931 (a)(2)(A).

IV. NEPA Strategy

The information below assists the NEPA staff in identifying (1) appropriate NEPA strategy (including if a FOA/topic area can be Categorically Excluded), (2) schedule and budget considerations, and (3) additional NEPA support for your FOA (i.e. special purpose review, etc.).

A. Will any **topics areas be limited to** information gathering, data analysis, and document preparation?

☐ No ☒ Yes, topic #:

If yes, please describe for each topic area:

Topic, 1.4, 2.5, 3.4, 4.1, 4.2

For 4.1 and 4.2: Efforts will be focused on workforce development/education

For 1.4,2.5,3.4 - Projects would be similar to those made through strategic programs Innovative Pathways FOA. All of those projects were given an exclusion by NEPA since they are office based

B. Is it anticipated that the selected projects will include any of the following activities?

a. **Demonstration-scale?** ☒ No ☐ Yes, topic #:

b. **Commercial-scale?** ☒ No ☐ Yes, topic #:

c. **New construction?** ☒ No ☐ Yes, topic #:

d. **Modification of existing facilities?** ☐ No ☒ Yes, topic #: the topics not listed for CX may involve equipment setup/upgrades

e. **Field studies and/or field testing of prototypes and/or equipment?** ☐ No ☐ Yes, topic #: the topics not listed for CX may involve testing things

If yes, please describe for each topic area:

This cannot be known in advance

V. Intellectual Property Strategy/Data Management

A. Will the recipient have the ability to mark data generated under the award as "protected" and thus prevent the data from being publicly disclosed for up to 5 years?

☐ Yes ☐ No ☒ Yes, but different for each topic area. Describe:

Not available for topic area 4 because not applicable to non-R&D related work

B. Describe the data plan for this FOA. Specifically, describe how information generated by the projects will be disseminated to ensure that it benefits entire industries and fields of knowledge. In addition, describe the types of data that will be made available to the public during the project (instead of being maintained as confidential for up to 5 years).

This language will be included in the FOA:

> For research projects, Applicants who's 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. At a minimum, the Data Management Plan 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 Data Management Plan must provide a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publication. As a courtesy, guidance for preparing a Data Management Plan is provided in Appendix D of the FOA.

C. When will applicants submit the Data Management Plan?

☐ With the Full Application ☒ During award negotiations (Topics 1,2,3)

☒ N/A (for Topic 4), Non-RD&D FOA

D. Will applicants be required to provide a U.S. Manufacturing Plan with their Full Application?

☐ Yes ☒ No, explain why below: ☐ N/A, Non-RD&D FOA

This would complicate the FOA review process, this information may be requested where applicable during the pre-selection interview process.

E. Will applicants be required to provide an IP Management Plan? *Note: These plans may add value when the awardee is a consortium or complex teaming arrangement and patentable inventions are expected to be jointly invented and licensed. Absent these circumstances, the administrative burden of producing and reviewing these plans may exceed this value.*

☒ No ☐ Yes ☐ N/A, Non-RD&D FOA

If yes, explain: (1) why plan would add value to the selection or project management process, and (2) when plan will be required (e.g., with application, 30 days post-selection, Q1 milestone).

F. Identify any additional intellectual property issues to discuss with the assigned patent attorney (e.g., software issues including open source software distribution, class patent waivers).

Topic 4 educational material will be available under a creative commons license

VI. Planned FOA Schedule

The FOA Manager is responsible for entering the FOA schedule below and in the FOA Tracker.

Estimated Date	Milestone/Activity
Nov 9, 2017	FOA Submission to FOA Team for Review *(allow 5 business days for review)*
Dec 1, 2017	Business Clearance Submission *(FOAs with DOE + Cost Share $50M or greater)*
NA	Notice of Intent Published *(14-30 days prior to FOA publish date)*
Dec 22, 2017	Publish FOA
Jan 25, 2018	LOI due date
Feb 1, 2018	Concept Paper Due Date *(generally 30 days after publish date)*
March 1, 2018	Send Encourage/Discourage Notifications to Applicants
April 2, 2018	Full Application Due Date *(generally 30 days after CP decision date)*
April 6, 2018	Reply to Reviewer Comments Deadline, if applicable *(minimum 3 business days from notifying applicants that comments are available in Exchange)*
April 11, 2018	Independent Reviewer Meeting, if applicable
April 17, 2018	Federal Consensus Board Meeting
May 9, 2018	Selection Official Signs Selection Statement
May 15, 2018	Send Selection Notifications to Applicants
May 15, 2018	Public Announcement *(consult with Tech Office Comms Lead and EERE Comms)*
Aug 2018	Award Issue Date

VII. Changes to Approved FRD

Changes that occur after the Director, Selection Official (if other than the Technology Office Director), CO, and Legal Counsel sign this document must follow the process below:

Type of Change	FOA Manager Action and Documentation
Change in FOA Concept, TRL or increase of $500K or more in federal funds	Re-brief EE-1 on FRD Part 1; Director signs revised document.
BEFORE FOA publish date: Any change to any section EXCEPT Section II.B, Evaluation and Selection Process	Notify Director, Selection Official (if other than the Technology Office Director), Contracting Officer, and Legal Counsel of the change via a comment bubble in the relevant section of the FOA. Director, Selection Official (if other than the Technology Office Director), Contracting Officer, and Legal Counsel approval/concurrence on the FOA constitutes

	their approval/concurrence with the change (no FRD modification necessary).
AFTER FOA publish date: Any change to any section EXCEPT Section II.B, Evaluation and Selection Process	Notify the Director, Selection Official (if other than the Technology Office Director), Contracting Officer, and Legal Counsel of the change. A FOA amendment may be required (no FRD modification necessary).
BEFORE the Full Application due date: Any change to Section II.B, Evaluation and Selection Process	FRD Part 2 modification signed by Director, Selection Official (if other than the Technology Office Director), Contracting Officer, and Legal Counsel.
AFTER the Full Application due date: Any changes to Section II.B, Evaluation and Selection Process	The FOA Manager must immediately notify Director, Selection Official (if other than the Technology Office Director), CO, and Legal Counsel of the change, and obtain email approval and concurrence, as applicable. Depending on the nature of the change, additional discussion, documentation and further action may be necessary. All changes must be documented in the Merit Review Advisory Report (MRAR).
Schedule changes	Update dates in the FOA Tracker.

1

2

FRD Approvals and Concurrence

Signatures constitute approval/concurrence with FRD Part 2 and the proposed evaluation and selection process for the FOA.

EERE Technology Office Director:

_____ _____

Signature Date

_____

Charlie Gay

CONCURRENCE of EERE Contracting Officer:

_____ _____

Signature Date

_____

Diana Bobo

CONCURRENCE of EERE Legal Counsel:

_____ _____

Signature Date

_____

Michael Goldstone

Rodriguez, Susan (CONTR)

From: Unruh, Timothy
Sent: Thursday, August 09, 2018 1:01 PM
To: Tripodi, Cathy
Cc: Jereza, Catherine
Subject: RE: Geothermal FOA

I am on travel this week, Cathy. I am at the IEEE mtg in Portland. I am vice chair on a standards group, and use the meeting to meet my annual continuing education requirements.

I am at PNNL. On Monday and Tuesday, travelling back Wednesday. I am available for a conference any time tmorow, or if you need me in the office, I will cancel the PNNL trip.

Let me know.

Thx

From: "Tripodi, Cathy" <Cathy.Tripodi@hq.doe.gov>
Sent: Aug 9, 2018 12:09 PM
To: "Unruh, Timothy" <Timothy.Unruh@EE.Doe.Gov>
Cc: "Jereza, Catherine" <Catherine.Jereza@Hq.Doe.Gov>
Subject: RE: Geothermal FOA

HI Tim:

Bruce and I were trying to find a time to discuss with you. I have looked for you several times this week to discuss. I keep missing you. Will discuss when we can all schedule a time to review.

Thanks,
Cathy T.

From: Unruh, Timothy
Sent: Thursday, August 09, 2018 2:24 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Cc: Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>
Subject: RE: Geothermal FOA

Anything from Bruce yet?

Thanks.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

From: Unruh, Timothy
Sent: Wednesday, August 08, 2018 1:23 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Cc: Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>
Subject: RE: Geothermal FOA

Just checking back in to see if you have heard from Bruce.

Thanks

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

From: Tripodi, Cathy
Sent: Monday, August 06, 2018 3:27 PM
To: Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>; Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Subject: RE: Geothermal FOA

I spoke to Bruce Walker and he is working on the language. He was hoping to have something by Wednesday. He wants the solar to be located closer to the grid to serve a national security priority mission. It would be best to wait for Bruce's language because I think I am unable to explain it like he can. Thanks.

From: Jereza, Catherine
Sent: Monday, August 06, 2018 3:22 PM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Subject: RE: Geothermal FOA

Sorry – I don't have one yet.

From: Unruh, Timothy
Sent: Monday, August 06, 2018 12:27 PM
To: Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>
Cc: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Subject: RE: Geothermal FOA

Any update on the Solar FOA language?

Thx

From: "Jereza, Catherine" <Catherine.Jereza@Hq.Doe.Gov>
Sent: Aug 2, 2018 9:19 AM
To: "Unruh, Timothy" <Timothy.Unruh@EE.Doe.Gov>
Subject: RE: Geothermal FOA

I was just about to send you an email! The no-news first. I'm not sure about the Solar, I'll have to get back to you on that.

The Water is ok. I don't have any changes.

Best
Katie

-----Original Message-----
From: Unruh, Timothy
Sent: Thursday, August 02, 2018 12:11 PM
To: Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>
Subject: FW: Geothermal FOA

Did you think you will have information back on the Water and Solar FOAs today? I wanted to update the programs on the status.

thx

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

-----Original Message-----
From: Unruh, Timothy
Sent: Thursday, August 02, 2018 7:45 AM
To: Jereza, Catherine <Catherine.Jereza@Hq.Doe.Gov>
Cc: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Subject: RE: Geothermal FOA

Thanks, we look forward to your feedback on the Water Power FOA: Topic Area 2.2 and the Solar FOA: Topic Area 1.

Thanks!

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

-----Original Message-----
From: Jereza, Catherine
Sent: Wednesday, August 01, 2018 8:50 PM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Subject: Geothermal FOA

Hi Tim - thanks for the meet up/not meet up yesterday. I had a chance to review this FOA and don't have any changes.

I'll get back on the other items as soon as possible.

Katie

Catherine Jereza

Deputy Assistant Secretary, Transmission Permitting & Technical Assistance
Office of Electricity
U.S. Department of Energy
(o) 202.586.0334
(c) (b) (6)

Vivian Walton
vivian.walton@hq.doe.gov
202.586.3876

** Please contact Vivian for all meeting and scheduling requests. **

Doc 35

Rodriguez, Susan (CONTR)

From: Gay, Charlie
Sent: Wednesday, August 15, 2018 9:40 AM
To: Jones-Albertus, Becca
Cc: Yuan, Guohui
Subject: RE: FY18 SETO FOA Coordination with OE

Likewise....

- Charlie
202-287-1987

From: Yuan, Guohui
Sent: Wednesday, August 15, 2018 12:40 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: RE: FY18 SETO FOA Coordination with OE

This looks good. No edits from me.

From: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Date: Wednesday, Aug 15, 2018, 12:27 PM
To: Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>, Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: FY18 SETO FOA Coordination with OE

Let me know what edits you have. Text also pasted below:

FY18 SETO Funding Opportunity Announcement (FOA) – Coordination with OE on Topic 1

Stage: FOA Drafting (October-March)

- October: SETO Director Charlie Gay met with Bill Parks (OE) for a high level discussion on the SETO FOA topics
- November-December: SETO staff brief OE staff and leadership (DAS Katie Jereza) on Topic 1, and Sub-topic 1.1 is identified as needing further joint development
- December – March: SETO staff worked closely with Gil Bindewald (OE) to reframe and finalize Sub-topic 1.1, and final language shared with DASes Katie Jereza and Michael Pesin before the FOA release in April

Stage: FOA Merit Review (May – August)

- Dan Ton from OE contributed concept paper reviews. Band width constraints prevented OE from participating in the full application review.

Stage: Federal Consensus Panel meetings (August)

- Three OE staff (Gil Bindewald, Stephen Walls and Chris Irwin) will participate in the Federal Consensus Panel meetings that will make recommendations to the Selection Official for Sub-topics 1.1-1.3

Rodriguez, Susan (CONTR)

From: Gay, Charlie
Sent: Wednesday, August 15, 2018 9:49 AM
To: Unruh, Timothy
Subject: FY18 SETO FOA Coordination History and Forward Planning with OE
Attachments: FY18 SETO FOA Coordination with OE.docx

Hi Tim:

Both Becca and Guohui have met with Gil to be sure that we're on the same page. Gil plans to meet with Adrienne to convey the details such that Bruce has the full background, when he addresses Cathy's question.

FY18 SETO Funding Opportunity Announcement (FOA) – Coordination with OE on Topic 1

Stage: FOA Drafting (October-March)

- November: SETO Director Charlie Gay met with Bill Parks (OE) for a high level discussion on the SETO FOA topics
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Stage: Federal Consensus Panel meetings (August)

- Three OE staff (Gil Bindewald, Stephen Walls and Chris Irwin) will participate in the Federal Consensus Panel meetings that will make recommendations to the Selection Official for Sub-topics 1.1-1.3

Stage: Negotiations (September – November)

- It is hoped that OE staff will be able to participate in negotiation of selected projects to ensure maximal impact and coordination of project scopes.

FY18 SETO Funding Opportunity Announcement (FOA) – Coordination with OE on Topic 1

Stage: FOA Drafting (October-March)

- November: SETO Director Charlie Gay met with Bill Parks (OE) for a high level discussion on the SETO FOA topics
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Stage: Negotiations (September – November)

- It is hoped that OE staff will be able to participate in negotiation of selected projects to ensure maximal impact and coordination of project scopes.

Doc 37

Rodriguez, Susan (CONTR)

From: Unruh, Timothy
Sent: Thursday, August 16, 2018 5:58 AM
To: Tripodi, Cathy
Cc: Fitzsimmons, Alexander;Hamos, Ian
Subject: Items for today's Tag-up Meeting

I wanted to give you a heads-up to the topics I need to cover with you today:

1) Wind Program Leadership
   (b) (5), (b) (6)

2) Solar FOA Language
   (b) (5)

3) Solar Prize Briefing
   (b) (5)

4) Geothermal Zonal Isolation FOA Awards
   (b) (5)

5) Geothermal Beyond Batteries Lab Call
   (b) (5)

6) Wind Alternate FOA
   (b) (5)

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Thursday, August 16, 2018 8:58 AM
To: Unruh, Timothy
Subject: FW: Follow up on Solar (SETO) FOA
Attachments: SETO_FY18_FOA_Topics_1.1-1.3.docx; FY18 SETO FOA Coordination with OE.docx

-----Original Message-----
From: Jones-Albertus, Becca
Sent: Thursday, August 16, 2018 9:32 AM
To: Lotto, Adrienne <Adrienne.Lotto@hq.doe.gov>
Cc: Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>; Bindewald III, Gilbert <Gilbert.Bindewald@hq.doe.gov>
Subject: Follow up on Solar (SETO) FOA

Dear Adrienne,

Thank you for the helpful discussion yesterday! Attached are two files as we discussed:

1. "SETO_FY18_FOA_Topics_1.1-1.3" contains the Systems Integration topics from our FOA. This is the exact language that's in the FOA. If a higher-level or shorter description would be more useful, just let me know and we can send that.

2. "FY18 SETO FOA Coordination with OE" is a short description of how we have worked (and plan to work, for the upcoming stages) together with Gil and others in your office during the FOA process

Last, just for your awareness, we also have a topic in the FOA related to workforce training for power systems engineers - Digital Adaptation Training for Distributed Energy Resources on the Grid (topic 4.2). We developed this topic in response to the OMB priority on STEM training, coupled with our awareness of a skills gap in the power systems industry in dealing with distributed solar energy and other DER technology (and the large amounts of data that come with it). Our team did get feedback from Katie Jereza and her team while developing that topic. If you'd like me to send you that topic area or any other information, please let me know.

Thank you again,
Becca

Becca Jones-Albertus, Ph.D
Deputy Director
Solar Energy Technologies Office
U.S. Department of Energy
Becca.Jones-Albertus@ee.doe.gov
(202) 287-1786

Solar Energy Technologies Office FY18 FOA: Topics 1.1 – 1.3 (Systems Integration)

Topic 1.1 Adaptive Solar Grid Integration

This topic will support applications to research and field validate innovative technologies that enable distributed solar photovoltaics (PV) to contribute to grid reliability and resilience by providing solar dispatchability and grid-support functions—including energy, capacity, and reliability and resilience services. These technologies can be deployed throughout the electric distribution system. The approaches will focus on developing flexible interconnection requirements and dynamic hosting capacity concepts for solar PV as opposed to today's prevalent "firm" interconnection requirements and static hosting capacity planning. It is expected that the same design concepts will be applicable for energy storage and other distributed energy resources (DERs). Through the intelligent control of the distributed assets, flexible interconnection requirements can increase the overall hosting capacity for solar and DERs in the distribution system, support diverse customer interconnection choices, improve system reliability and resilience, and reduce PV curtailment. Applications must consider diverse DER options (e.g. PV, energy storage, flexible load) available as well as power systems engineering alternatives, and demonstrate the benefits of the proposed technologies in the hosting capacity analysis. It should also be shown in these solutions how a fleet of PV systems from multiple customers at 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, control hardware and software innovations for smart PV inverters and DER management system (DERMS) that allow more flexibility to interconnection and operation of small scale PV and other DER systems.

Topic 1.2 Solar Observability

This topic will support applications to research, develop and validate observability or situational awareness technologies at the grid edge to support planning and operation with high PV penetration. Primary focus areas include PV-integrated sensor technologies, secure and robust communication, advanced data analytics (including machine learning) and detection of cyber-intrusion. Projects may also be considered with secondary focus areas, which enhance grid-edge observability of solar systems by integration with additional planning, operations and business unit systems. All applications should have an assessment of economic viability of the system or component in the application and as part of the project.

Topic 1.3 Solar + X

This topic will support applications to research and field validate innovative approaches to integrate Behind-the-Meter (BTM) solar PV with synergistic technologies (including but not limited to energy storage, building controls, demand response, electric vehicles, and other DERs) to support dispatchability and provide grid services – including energy, capacity, and reliability and resilience services – as a single control point. Projects will focus on research and development in control coordination and optimization of BTM customer-owned and co-located behind a single (master) meter: PV, storage, and other DER assets in response to broader system-wide conditions, with key interest in utilizing DER assets to provide critical power during outages. Projects may consider traditional "firm" DER interconnection requirements as well as emerging flexible interconnection approaches (such as those sought in Topic 1.1) and innovative compensation mechanisms. In an effort to minimize the overall system cost for solar integration arising from new hardware deployment, such as battery storage, applicants are encouraged to consider how solar and load estimation, advanced data analytics, and artificial intelligence can be utilized in the operations of their proposed systems. All Applicants should have an assessment of economic viability of the system or component in the application as part of the project.

FY18 SETO Funding Opportunity Announcement (FOA) – Coordination with OE on Topic 1

Stage: FOA Drafting (October-March)

- November: SETO Director Charlie Gay met with Bill Parks (OE) for a high level discussion on the SETO FOA topics
- November-December: SETO staff brief OE staff and leadership (DAS Katie Jereza) on Topic 1, and Sub-topic 1.1 is identified as needing further joint development
- December – March: SETO staff worked closely with Gil Bindewald (OE) to reframe and finalize Sub-topic 1.1, and final language for sub-topics 1.1-1.3 is shared with OE DASes Katie Jereza and Michael Pesin before the FOA release in April

Stage: FOA Merit Review (May – August)

- Dan Ton (OE) contributed concept paper reviews. Band width constraints prevented OE from participating in the full application review.

Stage: Federal Consensus Panel meetings (August)

- Three OE staff (Gil Bindewald, Stephen Walls and Chris Irwin) will participate in the Federal Consensus Panel meetings that will make recommendations to the Selection Official for Sub-topics 1.1-1.3

Stage: Negotiations (September – November)

- It is hoped that OE staff will be able to participate in negotiation of the projects selected under sub-topics 1.1-1.3 to ensure maximal impact and coordination of the projects.

Rodriguez, Susan (CONTR)

From: Unruh, Timothy
Sent: Tuesday, August 21, 2018 6:35 AM
To: Tripodi, Cathy
Cc: Fitzsimmons, Alexander;Hamos, Ian
Subject: Solar Language

Importance: High

Do you have any update on the language in the Solar FOA? Last Friday you indicated that it was still under consideration by Bruce Walker. They are holding the Federal Consensus Panel this week, so any information at this time would be useful.

Thanks.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

Doc 40

Rodriguez, Susan (CONTR)

Sent: Tuesday, August 21, 2018 7:02 AM
To: Unruh, Timothy
Cc: Fricker, Kyle
Subject: RE: Solar FOA

Hi Tim,

We got (b)(5) full applications, (b) (5)

The breakdown by topic is:

(b) (5)

(b) (5)

From: Unruh, Timothy
Sent: Tuesday, August 21, 2018 9:39 AM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Subject: Solar FOA

Can you share with me some stats on this FOA?

How many total applications?
How many applications for topic 1?, 2?, etc.

Thanks.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Tuesday, August 21, 2018 8:07 AM
To: Fricker, Kyle
Subject: RE: Solar FOA

Thanks!

From: Fricker, Kyle
Sent: Tuesday, August 21, 2018 10:57 AM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Subject: RE: Solar FOA

Minor corrections highlighted below.

From: Jones-Albertus, Becca
Sent: Tuesday, August 21, 2018 10:05 AM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>
Subject: RE: Solar FOA

Hi Tim,

We got 508 eligible full applications, from 46 states plus DC (38% of applications were from CA, AZ, TX and CO, reflecting major centers for solar research in CA, AZ and CO). The breakdown by topic is:

Systems Integration (Topics 1.1-1.3): 83
CSP Seedlings (Topic 2.1): 69
CSP standard awards (Topics 2.2-2.4): 46
PV seedlings (Topic 3.1): 154
PV non-seedlings (Topics 3.2-3.3): 94
Innovative Pathways (Topics 1.4, 2.5, 3.4): 82
Workforce (topics 4.1-4.2): 80

We had 1142 eligible concept papers, so we had an even larger response at that time. Weaker concept papers were discouraged (587 in total), stronger concept papers were encouraged (555 in total) —resulting in 508 eligible full apps (most discouraged concept papers do not submit full applications, although some do).

Becca

From: Unruh, Timothy
Sent: Tuesday, August 21, 2018 9:39 AM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Subject: Solar FOA

Can you share with me some stats on this FOA?

How many total applications?

How many applications for topic 1?, 2?, etc.

Thanks.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

Rodriguez, Susan (CONTR)

From: Gay, Charlie
Sent: Tuesday, August 21, 2018 2:13 PM
To: Hamos, Ian
Cc: Jones-Albertus, Becca;Unruh, Timothy
Subject: RE: Tim's Summary of Meeting with EE-1
Attachments: Power Connector Selection Memo for EE-1.docx

Hi Ian:

Attached is the Solar Prize write-up.....
The final scoring quantification by individual submission is treated as confidential to the integrity of NREL's responsibility as administrator. I have alerted Derek that he may need to weigh-in, if this becomes a sticking point.

- Charlie
202-287-1987

From: Hamos, Ian
Sent: Tuesday, August 21, 2018 8:31 AM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: RE: Tim's Summary of Meeting with EE-1

Yes, this is the fuel cell template. Just chatted with Tim this morning, and he wants to try to get something on the calendar with Cathy for tomorrow to discuss this and a couple other things. Can you have the updated doc by then? I don't have a specific time yet for the meeting, but is COB today or first thing tomorrow doable?

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: Hamos, Ian
Sent: Monday, August 20, 2018 11:31 AM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: Re: Tim's Summary of Meeting with EE-1

Yes it should be the one that fuel cells used. Will double check.

From: "Jones-Albertus, Becca" <Becca.Jones-Albertus@ee.doe.gov>
Sent: Aug 20, 2018 11:18 AM
To: "Gay, Charlie" <Charlie.Gay@EE.DOE.Gov>; "Hamos, Ian" <Ian.Hamos@EE.doe.gov>
Subject: RE: Tim's Summary of Meeting with EE-1

Hi Ian,

Is the "standard template" that was created for FOAs the one that Fuel Cells used to brief their FOA? If not, can you send (as we aren't aware of any standard template)?

Thanks!
Becca

From: Gay, Charlie
Sent: Monday, August 20, 2018 11:12 AM
To: Hamos, Ian <Ian.Hamos@EE.doe.gov>
Cc: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Subject: RE: Tim's Summary of Meeting with EE-1

Thanks Ian:

On the FOA – (b) (5)

For the prize-related Power Connectors – NREL made the selections. I'll touch base with Victor to determine what information is available for packaging ....

Charlie
202-287-1987

From: Hamos, Ian
Sent: Monday, August 20, 2018 9:55 AM
To: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: Tim's Summary of Meeting with EE-1

Charlie,

Tim did meeting with EE-1 on Friday, and managed to discuss a couple solar items. Below are his readouts, which both require action from us that Tim asked me to get started.

- Solar FOA Language: EE-1 is still awaiting changes from OE-1 regarding Topic 1. She asked us about making a public announcement about the changes now to properly inform the public. Please let me know thoughts on such action.
- Solar Prize Briefing: EE-1 would like to see the 5 awards put into the standard template that was created for FOAs and then be re-briefed using that form.

I'm here to talk through anything you like, and happy to brainstorm/review as needed.

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

PROCUREMENT SENSITIVE--- DO NOT DISTRIBUTE

August 20, 2018

SUMMARY OF AMERICAN MADE SOLAR PRIZE POWER CONNECTOR CONTRACT SELECTIONS

BACKGROUND:

The American-Made Solar Prize is a competition to revitalize U.S. solar manufacturing. The program will support entrepreneurs as they develop transformative ideas into concepts and then into early-stage prototypes ready for industry testing.

Entrepreneurial individuals and teams will compete through a series of three successive prize contests designed to develop new products to be made in America. Competitors will have access to mentoring and other supportive resources through a network of national labs, incubators, investors, and industry experts.

The American made solar prize was launched on June 7th, 2018 with the first contest closing on October 5, 2018. [1] The National Renewable Energy Laboratory (NREL) is the prize administrator for the American Made solar challenge. Part of the role of the prize administrator is to identify a set of entities that will serve as Power Connectors. These Power Connectors will support both the program and the Competitors, and a subset of two will host Demo Days. Up to five $100,000 Power Connector subcontracts and two $25,000 Demo Day contracts were competed using the NREL competitive approach, Request for Proposal (RFP) process. Below is the information NREL is able to share about the review process at this time. [2]

1. NREL created a web sign-up form for interested parties to sign up to be Connectors and indicate their interest in receiving the RFP for potential Power Connectors. Those interested in being a Power Connector provided a short description of their capabilities and interest. The web form informed the respondents that NREL and DOE were going to use the information provided to down select the RFP invitees.
2. NREL reviewed the 41 entities that indicated interest in being a Power Connector, DOE also reviewed and provided comments, NREL solicited 23 entities to respond to the RFP.
3. 8 organizations responded to the RFP and NREL reviewed all 8 proposals.
4. NREL performed a rigorous internal merit review of the RFP responses. (b) (5)

5. NREL evaluated and scored the 8 proposals against the qualitative merit criteria to determine the technical value of the proposal in meeting the objectives of the solicitation. DOE provided comments but did not provide scores.
6. NREL made the selection of the Power Connectors and has begun the negotiation process to get the 5 subcontracts in place for a September 4th start date.

[1] https://www.energy.gov/articles/department-energy-launches-3-million-prize-competition-boost-domestic-solar-manufacturing

[2] SETO staff were nonvoting participants in the review process and can validate the process was properly managed and equitable.

Power Connector Selections:

Selections (b) (5)	Organization Name
Selectee 1 (MA)	Greentown Labs
Selectee 2 (CA)	Powerhouse
Selectee 3 (MD)	Nation of Makers
Selectee 4 (PA)	The Wilton E. Scott Institute for Energy Innovation | Carnegie Mellon University
Selectee 5 (HI & CA)	Elemental Excelerator

Demo Day Selections:

Selections	Organization Name
Selectee 1 (MA)	Greentown Labs
Selectee 2 (CA)	Powerhouse

* (b) (5)

** (b) (5)

See Appendix A for the selection criteria and policy factors

RELEASE STRATEGY

SETO is working with Communications and Public Affairs to issue a press release on Sept 4th to announce the selections. EE-1's approval is requested to announce NREL's selection of the power connectors so that SETO can help NREL succeed in their effort to administer this prize (see Appendix B for schedule).

Appendix A: POWER CONNECTOR CRITERION (Weights total: 100%)

Criterion 6.1: (b) (5)

- (b) (5)
-
-
-
-

Criterion 6.2: (b) (5)

- (b) (5)
-
-
-

Criterion 6.3: (b) (5)

- (b) (5)
-

(b) (5)

-
-
-

Demo Day Criterion (Weights total: 100%)

Criterion 6.4: (b) (5)
(b) (5)

Criterion 6.5: (b) (5)

(b) (5)

Criterion 6.6: (b) (5)
(b) (5)

Policy Factors/Additional Factors for Evaluation

(b) (5)

These factors are not weighted.

Appendix B: Release Strategy Schedule

August 8	All communication materials provided to the front office
August 9	Front office reviews communication materials
August 21	Front office provides comments on communication materials
August 23	Final communication materials provided to Public Affairs
August 31	Courtesy sensitivity check (notifications and final sensitivity check are not required)
September 4	Press release issued

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Rodriguez, Susan (CONTR)

From: Unruh, Timothy
Sent: Wednesday, August 22, 2018 7:54 AM
To: Unruh, Timothy
Cc: Hamos, Ian
Subject: FW: Solar FOA Stats
Attachments: RE: Geothermal FOA

For Documentation Purposes:

1) (b) (6)

2) On Topic 1, Cathy was working directly with Bruce Walker to develop this language, as evidenced by the email from Cathy on August 6 indicating she was coordinating with Bruce.
3) The FOAs were all on the selection forms she asked for.
4) Wow...

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

From: Tripodi, Cathy
Sent: Wednesday, August 22, 2018 9:10 AM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: RE: Solar FOA Stats

Tim:
(b) (6)

(b) (5)

(b) (5)

(b) (5)

Of note is this seams effort. (b) (5)

We put a process in place to ensure that the Program responsibly closes out the end of FY 18. (b) (5)

Please note that your colleagues are utilizing the process.

Thank you,
Cathy T.

From: Unruh, Timothy
Sent: Tuesday, August 21, 2018 10:13 AM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>
Subject: Solar FOA Stats

Friday, you requested some preliminary stats from the Solar FOA. You wanted to know how many applications we received on Topic 1 (in italics and underlined, below). Here is the information for the full FOA as well.

# of Applications Received:

- Entire FOA = (b) (5)
  - (b) (5)
  -
  -
  -
  -

Overall, they received (b) (5) Concept Papers initially.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

Rodriguez, Susan (CONTR)

From: Murley, Susanna (CONTR)
Sent: Wednesday, August 22, 2018 11:07 AM
To: Vauss, Ebony;Fricker, Kyle
Cc: Jones-Albertus, Becca
Subject: RE: FY18 FOA approvals
Attachments: SETO Projects 2013-2018.xlsx

Hi folks -

I pulled the project map data for this task because it has cleaner data than the tracker (in terms of typos and naming consistency).

Here is a database of all of our funding opportunity (non-lab, non-prize) projects from 2013 to today by FOA with Name (including PI), location, and award amount.

Let me know if you'd like this in a different format. (A more readable Word format, perhaps?)

Best,

Susanna

Susanna Murley
Strategic Support Team Lead
The Building People, LLC | U.S. Department of Energy
Contractor supporting the Solar Energy Technologies Office
Office of Energy Efficiency and Renewable Energy
Office: 202.287.1637 | Cell: (b) (6)

-----Original Message-----
From: Vauss, Ebony
Sent: Thursday, July 19, 2018 10:35 AM
To: Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>
Subject: RE: FY18 FOA approvals

Location, name, FOA name, award amount. We talked about the project map. We can discuss more at our tag up.

Best,

Ebony, Solar Office
(202) 586-9879
(b) (6)

-----Original Message----
From: Murley, Susanna (CONTR)
Sent: Thursday, July 19, 2018 10:10 AM
To: Vauss, Ebony <Ebony.Vauss@ee.doe.gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>
Subject: RE: FY18 FOA approvals

What data would they want on each awardee? Is there a template or can we choose what to include?

Susanna Murley
Strategic Management Team Lead
The Building People, LLC | U.S. Department of Energy
Contractor supporting the Solar Energy Technologies Office
Office of Energy Efficiency and Renewable Energy
Office: 202.287.1637 | Cell: (b) (6)

-----Original Message-----
From: Vauss, Ebony
Sent: Thursday, July 12, 2018 11:48 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: RE: FY18 FOA approvals

*by awardee not buy.

Best,

Ebony, Solar Office
(202) 586-9879
(b) (6)

-----Original Message-----
From: Vauss, Ebony
Sent: Thursday, July 12, 2018 11:46 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: RE: FY18 FOA approvals

We asked about the project map, and they said, NO, they did not want that and instead maybe a breakout of awardee buy FOA over that last 5 years.

Best,

Ebony, Solar Office
(202) 586-9879
(b) (6)

-----Original Message-----
From: Jones-Albertus, Becca
Sent: Thursday, July 12, 2018 10:20 AM
To: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Kane, Victor <Victor.Kane@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: FY18 FOA approvals

Hi team,

Ebony just let me know that there is a new briefing process for FOAs for our Acting EE-1 Cathy Tripodi. (b) (5)

She does not want powerpoint decks, but rather a 1-2 page document. She is especially interested in the evaluation criteria used to make selections and who our past awardees have been compared to these awardees (b) (5)

We should strategize on how to get the briefing for Acting EE-1 into our extremely tight schedule, (b) (5)

Becca

FOA Name	Awardee and PI
CSP Heat Integration for Baseload R	Sacramento Municipal Utility District - Elaine Sison-Lebrilla
Diversity in Science and Technology	Delaware State University - Daniel Radu
Diversity in Science and Technology	University of Texas at San Antonio - Hariharan Krishnaswami
Foundational Program to Advance (	Arizona State University - Stuart Bowden
Foundational Program to Advance (	Georgia Tech - Ajeet Rohatgi
Foundational Program to Advance (	International Business Machines Corporation - Richard Haight
Foundational Program to Advance (	National Renewable Energy Laboratory - Teresa Barnes
Grid Engineering for Accelerated Re	Electric Power Research Institute - Thomas Reddoch
Grid Engineering for Accelerated Re	Interstate Renewable Energy Council - Joseph Sarubbi
Grid Engineering for Accelerated Re	University of Central Florida - Zhihua Qu
Grid Engineering for Accelerated Re	University of Missouri System - Suzanne Long
Improving the Accuracy of Solar For	International Business Machines Corporation - Hendrik Hamann
Improving the Accuracy of Solar For	University Corporation for Atmospheric Research - Sue Haupt
Incubator 8	Applied Novel Devices - Leo Mathew
Incubator 8	Brittmore Group - Bram Britcher
Incubator 8	CelLink Corporation - Kevin Coakley
Incubator 8	Clean Power Research - Scott Tewel
Incubator 8	ConnectDER (Formerly Infinite Invention) - Whitman Fulton
Incubator 8	Demeter Power Group - Micheal Wallander
Incubator 8	EnergySage - Vikram Aggarwal
Incubator 8	Folsom Labs - Paul Grana
Incubator 8	Genability - Eric Danziger
Incubator 8	Geostellar - Breighton Dawe
Incubator 8	kWh Analytics - Richard Matsui
Incubator 8	Picasolar (Formerly Si Solar Solutions) - Douglas Hutchings
Incubator 8	Renewable Power Conversion - Rick West
Incubator 8	Simply Civic - Dan Hensley
Incubator 8	SMASHsolar - Troy Tyler
Incubator 8	Solar Census - Aaron Woro
Incubator 8	Sun Number - David Herrmann
Incubator 8	Sunrun - Gary Wayne
Physics of Reliability: Evaluating De	Arizona State University - Dragica Vasileska
Physics of Reliability: Evaluating De	General Electric - Azam Thatte
Physics of Reliability: Evaluating De	National Renewable Energy Laboratory - Ross Larsen
Physics of Reliability: Evaluating De	Sandia National Laboratories - Jack Flicker
Physics of Reliability: Evaluating De	Stanford University - Reinhold Dauskardt
Plug-and-Play Photovoltaics	Fraunhofer USA, Center for Sustainable Energy Systems - Christi
Plug-and-Play Photovoltaics	North Carolina State University - Alex Huang
Rooftop Solar Challenge 2	Broward County - Armando Linares
Rooftop Solar Challenge 2	California Center for Sustainable Energy - Sachu Constantine
Rooftop Solar Challenge 2	City University of New York - Tria Case
Rooftop Solar Challenge 2	Clean Energy States Alliance - Warren Leon
Rooftop Solar Challenge 2	Mid America Regional Council - Georgia Nesselrode
Rooftop Solar Challenge 2	Optony - Ben Foster
Rooftop Solar Challenge 2	Washington Department of Commerce - Linda Irvine
Solar Energy Evolution and Diffusio	Massachusetts Institute of Technology - Jessika Trancik

Solar Energy Evolution and Diffusio	SRI International - Jeffrey Alexander
Solar Energy Evolution and Diffusio	University of North Carolina at Charlotte - Deborah Strumsky
Solar Energy Evolution and Diffusio	University of Texas at Austin - Varun Rai
Solar Energy Evolution and Diffusio	Yale University - Kenneth Gillingham
Solar Manufacturing Technology	Abengoa Solar - Patrick Marcotte
Solar Manufacturing Technology	PPG Industries - Irina Schwendeman
Solar Manufacturing Technology	Solaria Corporation - Adam Detrick
Solar Manufacturing Technology	SolarWorld Industries America - Michael Perelli-Minetti
Solar Manufacturing Technology	Suniva - Vijay Velundur
Solar Manufacturing Technology 2	1366 Technologies - Adam Lorenz
Solar Utility Networks: Replicable Ir	Aws Truepower - Kenneth Pennock
Solar Utility Networks: Replicable Ir	Clean Power Research - Tom Hoff
Solar Utility Networks: Replicable Ir	Electric Power Research Institute - Aidan Tuohy
Solar Utility Networks: Replicable Ir	Electricore - Tony Daye
Solar Utility Networks: Replicable Ir	Hawaiian Electric Company - Dora Nakafuji
Solar Utility Networks: Replicable Ir	National Rural Electric Cooperative Association - Craig Miller
Solar Utility Networks: Replicable Ir	Pepco Holdings - Steve Steffel
Solar Utility Networks: Replicable Ir	Pepco Holdings - Steve Steffel
Solar Utility Networks: Replicable Ir	University of California, San Diego - Carlos Coimbra
Efficiently Leveraging Equilibrium M	Colorado School of Mines - Gregory Jackson
Efficiently Leveraging Equilibrium M	Southern Research Institute - Santosh Gangwal
Efficiently Leveraging Equilibrium M	University of California, Los Angeles - Adrienne Lavine
Efficiently Leveraging Equilibrium M	University of Florida - Nicholas AuYeung
Improving the Accuracy of Solar For	Office of Oceanic and Atmospheric Research - Melinda Marquis
Incubator 8	Solar Nexus - Michael Palmquist
Incubator 9	Aurora Solar - Christopher Hopper
Incubator 9	Clean Energy Collective - Tom Hunt
Incubator 9	Faraday - Robert Adler
Incubator 9	GridUnity (Formerly Qado Energy) - Brian Fitzsimmons
Incubator 9	Intrinsiq Materials - Sujatha Ramanujan
Incubator 9	Norwich Technologies - Troy McBride
Incubator 9	Picasolar (Formerly Si Solar Solutions) - Doug Hutchings
Incubator 9	SafeConnect Solar - Zachary McNish
Incubator 9	Sighten - Conlan O'Leary
Incubator 9	Sinewatts - Shibashis Bhowmik
Incubator 9	SMASHsolar - Troy Tyler
Incubator 9	Solar Mosaic - Katie Gallinger
Incubator 9	Stem - Joe Matamoros
Incubator 9	Sundog Solar Technology - Randal Gee
Incubator 9	SunEdison (formerly Solar Grid Storage) - Daniel Dobbs
Incubator 9	Sungage Financial - Sara Ross
Incubator 9	Sunlayar - Anne Wright
Incubator 9	Sunpower Corporation - Eric Mansfield
Incubator 9	Sunvestment Group - Jim Kurtz
Incubator 9	Village Power Finance - Ty Jagerson
Next Generation Photovoltaic Techi	Duke University - David Mitzi
Next Generation Photovoltaic Techi	National Renewable Energy Laboratory - Aaron Ptak

Next Generation Photovoltaic Tech	National Renewable Energy Laboratory - Adele Tamboli
Next Generation Photovoltaic Tech	National Renewable Energy Laboratory - Kai Zhu
Next Generation Photovoltaic Tech	Sandia National Laboratories - Mark Allendorf
Next Generation Photovoltaic Tech	Stanford University - Michael McGehee
Next Generation Photovoltaic Tech	University of Houston - Venkat Selvamanickam
Next Generation Photovoltaic Tech	University of Michigan - Stephen Forrest
Next Generation Photovoltaic Tech	University of Nebraska-Lincoln - Jinsong Huang
Next Generation Photovoltaic Tech	University of Washington - Hugh Hillhouse
Rooftop Solar Challenge 2	Midwest Renewable Energy Association - Nick Hylla
Solar Manufacturing Technology 2	Cogenra Solar - Ratson Morad
Solar Manufacturing Technology 2	Enki Technology - Brenor Brophy
Solar Manufacturing Technology 2	Silevo - Carter Chang
Solar Manufacturing Technology 2	Siva Power (formerly Solexant) - Markus Beck
Solar Manufacturing Technology 2	Suniva - Vijay Velundur
Solar Manufacturing Technology 2	Technic - Lynn Michaelson
Solar Market Pathways	City and County of San Francisco - Allson Healy
Solar Market Pathways	City University of New York - Tria Case
Solar Market Pathways	Cook County - Deborah Stone
Solar Market Pathways	Ecolibrium3 - Jodi Slick
Solar Market Pathways	Institute for Sustainable Communities - Debra Perry
Solar Market Pathways	Pace Energy and Climate Center - Karl Rabago
Solar Market Pathways	Salt Lake City Corporation - Vicki Bennett
Solar Market Pathways	Smart Electric Power Alliance (formerly Solar Electric Power Ass
Solar Market Pathways	The Solar Foundation - Alexander Winn
Solar Market Pathways	Vermont Energy Investment Corporation - David Hill
Solar Market Pathways	Virginia Electric and Power Company - John Larson
	SolarWorld Industries America - Nathan Stoddard
Concentrating Solar Power: Advanc	Abengoa Solar - Dylan Grogan
Concentrating Solar Power: Advanc	Abengoa Solar - Kerry Manning
Concentrating Solar Power: Advanc	Argonne National Laboratory - Dileep Singh
Concentrating Solar Power: Advanc	Boston University - Malay Mazumder
Concentrating Solar Power: Advanc	Brayton Energy - Shaun Sullivan
Concentrating Solar Power: Advanc	Dartmouth College - Jifeng Liu
Concentrating Solar Power: Advanc	General Electric - GE Global Research - Bugra Ertas
Concentrating Solar Power: Advanc	Georgia Tech - Shannon Yee
Concentrating Solar Power: Advanc	Oregon State University - Kevin Drost
Concentrating Solar Power: Advanc	Purdue University - Kenneth Sandhge
Concentrating Solar Power: Advanc	SolarReserve - David Wait
Concentrating Solar Power: Advanc	Southern Research Institute - Tim Hansen
Concentrating Solar Power: Advanc	Southwest Research Institute - Jason Wilkes
Concentrating Solar Power: Advanc	University of Wisconsin - Mark Anderson
Incubator 9	kWh Analytics - Richard Matsui
Physics of Reliability: Evaluating De	Case Western Reserve University - Roger French
Physics of Reliability: Evaluating De	Electric Power Research Institute - Cara Libby
Physics of Reliability: Evaluating De	Lawrence Livermore National Laboratory - Mihail Bora
Physics of Reliability: Evaluating De	Sunpower Corporation - Staffan Westerberg
Physics of Reliability: Evaluating De	Underwriters Laboratories - Ken Boyce

Physics of Reliability: Evaluating De:	University of Illinois at Urbana-Champaign - Angus Rockett
Solar Manufacturing Technology 2	Norwich Technologies - Joel Stettenheim
Solar Market Pathways	Center for Sustainable Energy - Ben Airth
Solar Market Pathways	Council of Independent Colleges In Virginia - Robert Lambeth
Solar Market Pathways	Extensible Energy - Jill Cliburn
Solar Market Pathways	Midwest Renewable Energy Association - Nick Hylla
Solar Powering America by Recogni	The International City/County Management Association - Andre:
Solar Powering America by Recogni	The Solar Foundation - Philip Haddix
SunShot Technology to Market "Inc	CelLink Corporation - Kevin Coakley
SunShot Technology to Market: Inci	Amtech Systems - JeongMo Hwang
SunShot Technology to Market: Inci	Aurora Solar - Chris Hopper
SunShot Technology to Market: Inci	Cogenra Solar - Ratson Morad
SunShot Technology to Market: Inci	Concurrent Design - Tom Ortman
SunShot Technology to Market: Inci	Edgepower - Karl Swanson
SunShot Technology to Market: Inci	Enact Systems - Deep Chakraborty
SunShot Technology to Market: Inci	Enact Systems - Deep Chakraborty
SunShot Technology to Market: Inci	Folsom Labs - Paul Grana
SunShot Technology to Market: Inci	GeoCF - Clay Butler
SunShot Technology to Market: Inci	Halo Industries - Andrei Iancu
SunShot Technology to Market: Inci	kWh Analytics - Richard Matsui
SunShot Technology to Market: Inci	Nevados Engineering - Yezin Taha
SunShot Technology to Market: Inci	Powerscout - Kumar Dhuvur
SunShot Technology to Market: Inci	Ra Power Management - Aaron Iverson
SunShot Technology to Market: Inci	Safeconnect Solar - Brian Cunningham
SunShot Technology to Market: Inci	Sensanna - Jacqueline Hines
SunShot Technology to Market: Inci	Sistine Solar - Senthil Balasubramanian
SunShot Technology to Market: Inci	SolarRetina - Mark Handschy
SunShot Technology to Market: Inci	Sunfield Semiconductor - Steve Robbins
SunShot Technology to Market: Inci	SunPower Corporation - Cedric Jeanty
SunShot Technology to Market: Inci	Sunrun - Gary Wayne
SunShot Technology to Market: Inci	UtilityAPI - Elena Lucas
Sustainable and Holistic Integration	Austin Energy - Karl Popham
Sustainable and Holistic Integration	Carnegie Mellon University - Soummya Kar
Sustainable and Holistic Integration	Commonwealth Edison Company - Shay Bahramirad
Sustainable and Holistic Integration	Electric Power Research Institute - Aminul Huque
Sustainable and Holistic Integration	Fraunhofer USA, Center for Sustainable Energy Systems - Kurt R
Sustainable and Holistic Integration	Hawaiian Electric Company - Shari Ishikawa
Concentrating Solar Power: Concen	Agira Inc. - Bal Mukund Dhar
Concentrating Solar Power: Concen	Giant Leap Technologies - Leo DiDomenico
Concentrating Solar Power: Concen	Hyperlight Energy - John King
Concentrating Solar Power: Concen	Sunvapor Inc. - Philip Gleckman
Concentrating Solar Power: Concen	University of California, San Diego - Boubacar Kante
Concentrating Solar Power: Concen	University of Illinois at Urbana-Champaign - Kimani Toussaint
Orange Button℠ - Solar Bank	kWh Analytics - Richard Matsui
Orange Button℠ - Solar Bank	National Renewable Energy Laboratory - Debbie Brodt-Giles
Orange Button℠ - Solar Bank	Smart Grid Interoperability Panel 2.0 - Sharon Stone
Orange Button℠ - Solar Bank	SunSpec Alliance - Thomas Tansey

Photovoltaic Research and Develop Arizona State University - Zachary Holman
Photovoltaic Research and Develop Arizona State University - Mariana Bertoni
Photovoltaic Research and Develop Case Western Reserve University - Timothy Peshek
Photovoltaic Research and Develop Colorado State University - Jason Kephart
Photovoltaic Research and Develop nLiten Energy - Alan Chin
Photovoltaic Research and Develop South Dakota School of Mines and Technology - Phil Ahrenkiel
Photovoltaic Research and Develop University at Buffalo, State University of New York - Hao Zeng
Photovoltaic Research and Develop University of Colorado Boulder - Alex Zunger
Photovoltaic Research and Develop University of Florida - Jiangeng Xue
Photovoltaic Research and Develop University of Oregon - Shannon Boettcher
Photovoltaics Research and Develo| Arizona State University - Zachary Holman
Photovoltaics Research and Develo| Arizona State University - Zachary Holman
Photovoltaics Research and Develo| Arizona State University - Govindasamy Tamizhmani
Photovoltaics Research and Develo| Arizona State University - Stuart Bowden
Photovoltaics Research and Develo| Arizona State University - Dragica Vasileska
Photovoltaics Research and Develo| Colorado School of Mines - Sumit Agarwal
Photovoltaics Research and Develo| Colorado State University - James Sites
Photovoltaics Research and Develo| Georgia Tech - Ajeet Rohatgi
Photovoltaics Research and Develo| Massachusetts Institute of Technology - Tonio Buonassisi
Photovoltaics Research and Develo| Ohio State University - Tyler Grassman
Photovoltaics Research and Develo| SRI International - Jordi Perez
Photovoltaics Research and Develo| Texas State University - Jian Li
Photovoltaics Research and Develo| University of Central Florida - Kris Davis
Photovoltaics Research and Develo| University of Delaware - William Shafarman
Photovoltaics Research and Develo| University of Delaware - Steven Hegedus
Photovoltaics Research and Develo| University of Illinois at Chicago - Robert Kile
Photovoltaics Research and Develo| University of Michigan - Al-Thaddeus Avestruz
Photovoltaics Research and Develo| Washington State University - Kelvin Lynn
Solar Energy Evolution and Diffusio| Arizona State University - Jacqueline Hettel
Solar Energy Evolution and Diffusio| Center for Sustainable Energy - Margaret Taylor
Solar Energy Evolution and Diffusio| Clean Energy States Alliance - Warren Leon
Solar Energy Evolution and Diffusio| Massachusetts Institute of Technology - Jessika Trancik
Solar Energy Evolution and Diffusio| Minnesota Department of Commerce - Stacy Miller
Solar Energy Evolution and Diffusio| Montana State Energy Office - Garrett Martin
Solar Energy Evolution and Diffusio| National Renewable Energy Laboratory - Benjamin Sigrin
Solar Energy Evolution and Diffusio| Nhu Energy - Rick Meeker
Solar Energy Evolution and Diffusio| North Carolina Clean Energy Technology Center - Thomas Clevel
Solar Energy Evolution and Diffusio| PA Department of Environmental Protection - Hayley Book
Solar Energy Evolution and Diffusio| Solstice Initiative - Stephanie Speirs
Solar Energy Evolution and Diffusio| SRI International - Christina Freyman
Solar Energy Evolution and Diffusio| University of Texas at Austin - Varun Rai
Solar Energy Evolution and Diffusio| Virginia Polytechnic Institute and State University - Achla Marati
Solar Energy Evolution and Diffusio| Washington Department of Commerce - Jaimes Valdez
Solar Energy Evolution and Diffusio| Western Interstate Energy Board - Maury Galbraith
Solar Energy Evolution and Diffusio| Yale University - Kenneth Gillingham
Solar Training and Education for Pr| Clean Energy States Alliance - Warren Leon
Solar Training and Education for Pr| Electric Power Research Institute - Thomas Reddoch

Solar Training and Education for Pr Elevate Energy - Pamela Brookstein
Solar Training and Education for Pr George Washington University - Amit Ronen
Solar Training and Education for Pr Interstate Renewable Energy Council - Laure-Jeanne Davignon
Solar Training and Education for Pr National Conference of State Legislatures - Glen Anderson
Solar Training and Education for Pr North American Board of Certified Energy Practitioners - Shawn
Solar Training and Education for Pr The Solar Foundation - Ed Gilliland
Solar Training and Education for Pr Trust for Conservation Innovation - Maureen Guttman
Solar Training and Education for Pr University of Central Florida - Zhihua Qu
SunShot Technology to Market: Inc Certain Solar - Nalin Kulatilaka
SunShot Technology to Market: Inc Picasolar (Formerly Si Solar Solutions) - Doug Hutchings
Technology to Market 2: Incubator ABB Inc. - Sandeep Bala
Technology to Market 2: Incubator Amicus Solar Cooperative - Amanda Bybee
Technology to Market 2: Incubator Crystal Solar - Ruiying Hao
Technology to Market 2: Incubator EnergyBin - Keith Bluford
Technology to Market 2: Incubator Ethical Electric - Daniel Murray
Technology to Market 2: Incubator Genbright - Aram Sogomonian
Technology to Market 2: Incubator GridUnity (Formerly Qado Energy) - Alex Dinkel
Technology to Market 2: Incubator Interplay Learning - Doug Donovan
Technology to Market 2: Incubator Kevala - Alan Becker
Technology to Market 2: Incubator Operant Solar - Randy King
Technology to Market 2: Incubator Pika Energy, Inc. - Joshua Kaufman
Technology to Market 2: Incubator PowerScout - Kumar Dhuvur
Technology to Market 2: Incubator Solar Dynamics - Hank Price
Technology to Market 2: Incubator SolarWorld Industries America - Beryl Weinshenker
Technology to Market 2: Incubator Soliculture - Glenn Alers
Technology to Market 2: Incubator Sunfolding - Leila Madrone
Technology to Market 2: Incubator Suniva - Vijay Yelundur
Technology to Market 2: Incubator Sunpreme - Farhad Moghadam
Technology to Market 2: Incubator Tessolar - Jaco Pretorius
Technology to Market 2: Incubator Ultrasonic Technologies - Sergei Ostapenko
Technology to Market 2: Incubator WattGlass - Corey Thompson
Enabling Extreme Real-Time Grid In Advanced Microgrid Solutions - Steven Alains
Enabling Extreme Real-Time Grid In National Renewable Energy Laboratory - Murali Baggu
Enabling Extreme Real-Time Grid In National Renewable Energy Laboratory - Yingchen Zhang
Enabling Extreme Real-Time Grid In Northeastern University - Ali Abur
Enabling Extreme Real-Time Grid In PPL Electric Utilities - Megan Toomey
Enabling Extreme Real-Time Grid In Quanta Technology - Ralph Masiello
Enabling Extreme Real-Time Grid In Sandia National Laboratories - Jay Johnson
Enabling Extreme Real-Time Grid In Southern California Edison - Robert Sherick
Enabling Extreme Real-Time Grid In University of California, Berkeley - Carl Blumstein
Enabling Extreme Real-Time Grid In University of California, Riverside - Hamed Mohsenian-Rad
Enabling Extreme Real-Time Grid In University of Central Florida - Zhihua Qu
Enabling Extreme Real-Time Grid In University of Southern California - Viktor Prasanna
Enabling Extreme Real-Time Grid In University of Vermont - Mads Almassalkhi
Photovoltaic Research and Develop Arizona State University - Mariana Bertoni
Photovoltaic Research and Develop Arizona State University - Stuart Bowden
Photovoltaic Research and Develop Arizona State University - Meng Tao

Photovoltaic Research and Develop Arizona State University - Owen Hildreth
Photovoltaic Research and Develop Arizona State University - Mariana Bertoni
Photovoltaic Research and Develop Arizona State University - Govindasamy Tamizhmani
Photovoltaic Research and Develop BrightSpot Automation - Andrew Gabor
Photovoltaic Research and Develop Case Western Reserve University - Roger French
Photovoltaic Research and Develop Colorado School of Mines - Sumit Agarwal
Photovoltaic Research and Develop Colorado School of Mines - Alan Sellinger
Photovoltaic Research and Develop Colorado State University - Jason Kephart
Photovoltaic Research and Develop Colorado State University - Kurt Barath
Photovoltaic Research and Develop Electric Power Research Institute - Michael Bolen
Photovoltaic Research and Develop Fraunhofer USA, Center for Sustainable Energy Systems - Christi
Photovoltaic Research and Develop Lehigh University - Nicholas Strandwitz
Photovoltaic Research and Develop Massachusetts Institute of Technology - Jeehwan Kim
Photovoltaic Research and Develop Portland State University - Raul Cal
Photovoltaic Research and Develop Power Factors - Steve Voss
Photovoltaic Research and Develop Stanford University - Reinhold Dauskardt
Photovoltaic Research and Develop Stanford University - Michael McGehee
Photovoltaic Research and Develop Stion Corporation - Eric Lee
Photovoltaic Research and Develop SunPower Corporation - Richard Sewell
Photovoltaic Research and Develop University of California, Berkeley - Ali Javey
Photovoltaic Research and Develop University of California, San Diego - David Fenning
Photovoltaic Research and Develop University of Central Florida - Kristopher Davis
Photovoltaic Research and Develop University of Central Florida - Joseph Walters
Photovoltaic Research and Develop University of Colorado Boulder - Alex Zunger
Photovoltaic Research and Develop University of Utah - Michael Scarpulla
Technology to Market Technology t Echogen Power Systems - Timothy Held
Technology to Market Technology t Energetic Insurance - Jeff McAulay
Technology to Market Technology t Energy Materials Corporation - Stephan DeLuca
Technology to Market Technology t EnergySage - Jamie Biggar
Technology to Market Technology t Halo Industries - Andrei Iancu
Technology to Market Technology t KryptonCloud - Ed Albanese
Technology to Market Technology t Leading Edge Crystal Technologies - Peter Kellerman
Technology to Market Technology t Next Energy Technologies - Corey Hoven
Technology to Market Technology t Omnidian - David Kenny
Technology to Market Technology t Operant Solar Corporation - Randy King
Technology to Market Technology t P4P Energy - Michael Fuller
Technology to Market Technology t Pace Avenue - Gary Kremen
Technology to Market Technology t Power Integration Laboratory - Robert Pilawa
Technology to Market Technology t SenSanna Incorporated - Jacqueline Hines
Technology to Market Technology t Solar Dynamics - Patrick Marcotte
Technology to Market Technology t SolarReserve - William Gould
Technology to Market Technology t Tomark-Worthen - Christopher Thellen
Technology to Market Technology t UtilityAPI - Daniel Roesler

Project_Title	Status	Award_Sta	Total_Government	City	State
Consumnes Power Plant (CPP) Solar Au	Inactive	2013	$10,000,000	Sacramenti	CA
High-Efficiency Thin-Film Fe2sis4 And Fe	Inactive	2013	$326,139	Dover	DE
Distinct: Diversity in Solar Talent Throug	Inactive	2013	$750,000	San Antoni	TX
Thin Silicon Solar Cells: A Path To 35% S	Inactive	2013	$3,496,535	Tempe	AZ
Overcoming The Fundamental Bottlene	Inactive	2013	$3,500,000	Atlanta	GA
Driving Czts to the Sq Limit: Solving The	Inactive	2013	$4,497,657	Yorktown H	NY
Approaching the Shockley-Queisser Lim	Inactive	2013	$4,500,000	Golden	CO
Leveraging Industry Research to Educat	Active	2013	$4,200,001	Palo Alto	CA
National Network Administrator of GEA	Active	2013	$1,100,000	Albany	NY
Foundations for Engineering Education	Active	2013	$3,223,000	Orlando	FL
The Mid-America Regional Microgrid Ed	Active	2013	$4,299,856	Rolla	MO
A Multi-Scale, Multi-Model, Machine-Le	Inactive	2013	$2,519,649	Yorktown H	NY
A Public-Private-Academic Partnership "	Inactive	2013	$3,210,000	Boulder	CO
Manufacturable High Efficiency (> 20%)	Inactive	2013	$500,000	Austin	TX
Utility-Scale Pv Cost Reduction: Panelize	Inactive	2013	$689,708	San Jose	CA
Interconnect Circuit Reliability and Scal	Inactive	2013	$703,519	San Carlos	CA
PowerClerk	Inactive	2013	$945,529	Napa	CA
Solar to Meter Socket Integrator	Inactive	2013	$499,999	Falls Churcl	VA
Pace3P Financing Platform: Scalable Thi	Inactive	2013	$500,000	West Palm	FL
Consumer Destination Site For PV Featu	Inactive	2013	$1,250,000	Boston	MA
Automatic Design Optimization Softwar	Inactive	2013	$350,000	San Francis	CA
Verified Solar Savings	Inactive	2013	$1,000,000	San Francis	CA
Solar Data Everywhere	Inactive	2013	$750,000	Martinsbur	WV
Aggregated Solar Asset Data For Efficier	Inactive	2013	$450,000	Oakland	CA
One Step Super Emitters for High Efficie	Inactive	2013	$500,000	Fayettevill	AR
Macro-Micro PV Inverter Commercializa	Inactive	2013	$1,003,605	San Luis Ob	CA
Application To Streamline Solar Soft Co	Inactive	2013	$400,000	Parker	CO
SMASH HIT	Inactive	2013	$500,000	El Cerrito	CA
The Final Breakthrough in Solar Mappin	Inactive	2013	$735,072	Sebastopol	CA
Sun Number Commercialization	Inactive	2013	$1,000,000	Deephaven	MN
End-to-End Workflow Automation for S	Inactive	2013	$1,600,000	San Francis	CA
Unified Numerical Solver for Device Me	Inactive	2013	$1,417,100	Tempe	AZ
Physics-Based Reliability Models for Sup	Inactive	2013	$1,933,139	Schenectac	NY
Predictive Physico-Chemical Modeling c	Active	2013	$1,556,250	Golden	CO
Module Level Power Electronics Reliabil	Active	2013	$1,387,500	Albuquerqu	NM
Coupled Thermo-Mechanical and Photo	Inactive	2013	$1,165,500	Stanford	CA
Plug & Play Solar PV for American Home	Inactive	2013	$8,250,226	Cambridge	MA
Development of a Low Cost, Residential	Inactive	2013	$2,954,940	Raleigh	NC
Go Solar - Florida	Inactive	2013	$1,575,000	Fort Lauder	FL
Golden State Solar Impact	Inactive	2013	$1,299,522	San Diego	CA
NYSOLAR Smart	Inactive	2013	$1,400,000	New York	NY
New England Solar Cost-Reduction Parti	Inactive	2013	$1,500,000	Montpelier	VT
Solar Ready II	Inactive	2013	$2,575,000	Kansas City	MO
American Solar Transformation Initiativ	Inactive	2013	$1,199,598	Santa Clara	CA
Pacific Northwest Solar Partnership	Inactive	2013	$1,650,000	Olympia	WA
Evaluating The Causes of Photovoltaics	Inactive	2013	$493,161	Cambridge	MA

Hellos: Understanding Solar Evolution T	Inactive	2013	$597,810	Menlo Park	CA
Forecasting and Influencing Technologi	Inactive	2013	$949,131	Charlotte	NC
Towards An Emergent Model of Techno	Inactive	2013	$500,500	Austin	TX
The Influence of Novel Behavioral Strat	Inactive	2013	$1,899,081	New Haver	CT
Improved Large Aperture Collector Mar	Inactive	2013	$1,943,463	Lakewood	CO
Rapid, Compact C-Si Module Manufactu	Inactive	2013	$2,148,729	Allison Parl	PA
Development of Manufacturing Techno	Inactive	2013	$2,007,474	Fremont	CA
Highly Automated Module Production L	Inactive	2013	$2,438,126	Hillsboro	OR
Road To Grid Parity Through Deployme	Inactive	2013	$4,499,678	Norcross	GA
Enabling Automation for <$0.10/W High	Inactive	2013	$1,000,000	Lexington	MA
Comprehensive Solutions for Integratio	Inactive	2013	$399,980	Albany	NY
Utility-Scale Pv Cost Reduction: Panelize	Inactive	2013	$500,000	Napa	CA
Operational Simulation Tools and Long	Inactive	2013	$898,347	Palo Alto	CA
Integrated Simulation Development and	Inactive	2013	$420,155	Valencia	CA
Distributed Resource Energy Analysis ar	Inactive	2013	$500,000	Honolulu	HI
Solar Utility Network Deployment Accel	Inactive	2013	$3,645,657	Arlington	VA
Model-Based Integrated High Penetrati	Inactive	2013	$979,293	Washingtor	DC
Model-Based Integrated High Penetrati	Inactive	2013	$979,293	Washingtor	DC
Intra-Hour Dispatch and Automatic Gen	Inactive	2013	$554,900	La Jolla	CA
Efficiently Leveraging Equilibrium Mech	Inactive	2014	$1,008,511	Golden	CO
Regenerative Carbonate-Based Thermo	Inactive	2014	$836,696	Birminghar	AL
Thermochemical Storage with Anhydrou	Inactive	2014	$1,182,788	Los Angele:	CA
Carbon Dioxide Shuttling Thermochemi	Inactive	2014	$791,200	Gainsville	FL
Solar Forecast Improvement Project	Inactive	2014	$1,000,000	Silver Sprin	MD
Next Generation Workflow Platform & I	Inactive	2014	$496,987	Berkeley	CA
Integrated Platform for Optimized Solar	Inactive	2014	$400,006	Palo Alto	CA
National Community Solar Platform	Inactive	2014	$699,999	Carbondale	CO
Faraday Customer Acquisition Software	Inactive	2014	$1,000,000	Middlebur	VT
Distribution Grid Analytics Platform for	Inactive	2014	$1,750,000	Summit	NJ
Printed Nano Cu and Nisi Contacts and I	Inactive	2014	$450,000	Rochester	NY
Second Generation Novel High Temper	Inactive	2014	$677,504	White Rive	VT
One Step Super Emitters for High Efficie	Inactive	2014	$800,000	Fayettevill	AR
Reducing Hard Costs Through Software	Inactive	2014	$499,220	Honolulu	HI
Deploying an Integrated and Comprehe	Inactive	2014	$1,000,000	San Francis	CA
Single Silicon Integrated Circuit Photovc	Inactive	2014	$1,000,000	Palo Alto	CA
SMASH HIT 2	Inactive	2014	$1,000,000	Richmond	CA
Mosaic Home Solar Loan	Inactive	2014	$650,000	Berkeley	CA
Energy Storage Control Algorithms To R	Inactive	2014	$936,554	Millbrae	CA
Development of An Abrasion-Resistant	Inactive	2014	$455,793	Arvada	CO
Development of A Solar Storage Operat	Inactive	2014	$968,120	Silver Sprin	MD
Transforming Residential Solar Through	Inactive	2014	$700,000	Boston	MA
Sunlayar, Augmented Reality Edition; Fr	Inactive	2014	$384,000	Walnut Cre	CA
Reducing BOS Costs, Improving Reliabili	Inactive	2014	$585,000	San Jose	CA
Web Platform Application	Inactive	2014	$398,379	Cortland	NY
Community Crowd-Funded Solar Develc	Inactive	2014	$500,000	Palo Alto	CA
High Performance Perovskite-Based Sol	Active	2014	$1,300,002	Duraham	NC
Optimized, Low-Cost, Higher Than 30 P	Active	2014	$1,500,000	Golden	CO

Selective Area Growth of III-V Materials	Active	2014	$1,500,000	Golden	CO
Ultra High-Efficiency and Low-Cost Poly	Active	2014	$1,360,000	Golden	CO
A New, Integrated Materials Platform to	Active	2014	$1,354,245	Livermore	CA
Perovskite Solar Cells for High-Efficiency	Inactive	2014	$1,484,623	Stanford	CA
High Efficiency, Inexpensive Thin Film III	Active	2014	$1,499,994	Houston	TX
Reliable and Large Organic Solar Cells O	Active	2014	$1,350,000	Ann Arbor	MI
Developing Efficient Perovskite and Silic	Active	2014	$1,211,075	Lincoln	NE
Rapid Development of Hybrid Perovskit	Active	2014	$1,500,000	Seattle	WA
Midwest Grow Solar Partnership	Inactive	2014	$1,897,346	Custer	WI
Automated Manufacturing of Innovativ	Inactive	2014	$1,993,383	Mountain \	CA
Integrated Glass Coating Manufacturing	Inactive	2014	$2,000,000	San Jose	CA
Manufacturing of Silicon Tunnel Junctio	Inactive	2014	$4,918,326	Fremont	CA
2 Meter Linear High Temperature Evapo	Inactive	2014	$2,998,436	San Jose	CA
Towards The Next Generation 23% Effic	Inactive	2014	$2,300,506	Norcross	GA
Silver-Free Metallization Technology for	Inactive	2014	$900,000	Cranston	RI
Solar Plus Storage for Resiliency	Active	2014	$1,321,200	San Francis	CA
NYSolar Smart Distributed Generation H	Active	2014	$859,720	New York	NY
Facilitating Deployment of Community S	Inactive	2014	$1,238,308	Chicago	IL
Local Energy Matters: Solar Market Dev	Inactive	2014	$209,005	Duluth	MN
Solar Market Pathways National Coordi	Active	2014	$1,872,845	Montpelier	VT
Northeast Solar Energy Market Coalitio	Inactive	2014	$599,908	White Plair	NY
Wasatch Solar Project	Active	2014	$600,000	Salt Lake Ci	UT
Community Solar Design Models for Co	Active	2014	$705,830	Washingto	DC
Commercial Property Assessed Clean En	Active	2014	$900,034	Washingto	DC
Solar and Distributed Generation As Ke	Inactive	2014	$533,361	Burlington	VT
Virginia Solar Pathways Project	Inactive	2014	$2,430,682	Richmond	VA
Neogrowth Silicon: Us Manufacturing o	Inactive	2014	$4,000,000	Hillsboro	OR
AETHER: Advanced Energy Tower, High	Inactive	2015	$2,697,434	Lakewood	CO
ATLAS: Advanced Trough with Lower-co	Inactive	2015	$1,221,015	Lakewood	CO
High Efficiency Latent Heat Based Therr	Active	2015	$1,050,000	Lemont	IL
Enhancement of Optical Efficiency of CS	Active	2015	$1,150,000	Boston	MA
Integrated Solar Receiver with Thermal	Active	2015	$2,600,000	Hampton	NH
Thermodynamically Stable, High Tempe	Active	2015	$656,831	Hanover	NH
Compression System Design and Testing	Active	2015	$3,800,000	Niskayuna	NY
Sodium Ion Expansion Engine Power Blo	Active	2015	$2,348,780	Salt Lake Ci	UT
High Flux Microchannel Receiver Develo	Active	2015	$2,000,000	Corvallis	OR
Robust, Cost-Effective Heat Exchangers	Active	2015	$3,845,079	West Lafay	IN
Development of 800°C Integrated	Active	2015	$2,357,159	Santa Mon	CA
Demonstration of High-Temperature Ca	Active	2015	$2,000,000	Birminghar	AL
Development of an Integrally Geared C	Active	2015	$5,350,000	San Antoni	TX
Advanced Supercritical Carbon Dioxide	Active	2015	$1,899,986	Madison	WI
Fico for Solar Performance Risk	Inactive	2015	$500,000	San Francis	CA
Module-Level Exposure and Evaluation	Active	2015	$1,350,000	Cleveland	OH
Novel Accelerated Aging Protocols for P	Active	2015	$1,042,496	Palo Alto	CA
Non-Destructive Evaluation of Water In	Active	2015	$570,000	Livermore	CA
Predictive Models and Novel Accelerate	Active	2015	$1,350,000	San Jose	CA
Backsheets: Correlation of Long-Term F	Inactive	2015	$1,349,746	San Jose	CA

Generalizable Mechanistic Understandi	Active	2015	$1,349,998	Urbana	IL
Design and Field Testing of Manufactur	Active	2015	$1,390,691	White Rive	VT
Virtual Net Metering Market Developm	Active	2015	$712,269	San Diego	CA
A Solar Market Pathway for Independer	Active	2015	$807,563	Bedford	VA
High-Value Integrated Community Solar	Inactive	2015	$800,000	Lafayette	CA
The Solar Endowment: A PV Investment	Active	2015	$1,025,400	Custer	WI
Solar Powering America by Recognizing	Active	2015	$2,998,449	Washingtor	DC
SPARC SolSmart Technical Assistance	Active	2015	$9,999,996	Washingtor	DC
Interconnect Circuit Manufacturing Tecl	Active	2015	$2,500,000	San Carlos	CA
Efficiency Enhancement in C-Si Solar Ce	Inactive	2015	$930,664	Tempe	AZ
Using Computer Vision for Automated F	Inactive	2015	$400,000	Palo Alto	CA
Catalyzing Photovoltaic Manufacturing I	Inactive	2015	$5,499,551	Fremont	CA
The Energy Switch	Inactive	2015	$1,000,000	Austin	TX
Predictive Solar-Integrated Commercial	Inactive	2015	$495,248	Aspen	CO
OpACT Solar Business Operations Analy	Inactive	2015	$449,671	Pleasanton	CA
PACE Solar Accelerator	Inactive	2015	$498,965	Pleasanton	CA
Solar Permit Generator	Inactive	2015	$296,000	San Francis	CA
Smart Power Maps	Inactive	2015	$773,500	Austin	TX
Materials Development and Manufactu	Inactive	2015	$1,000,000	San Mateo	CA
Solar for The Other 35%	Inactive	2015	$599,974	San Francis	CA
Installation and Soft Cost Reduction for	Inactive	2015	$773,124	San Francis	CA
Powerscout.com, The First Big Data Ena	Inactive	2015	$1,500,000	Pleasanton	CA
RPM Asset Management Platform (AMF	Inactive	2015	$500,000	Oakland	CA
Safeconnect Solar: Reducing Soft Costs '	Active	2015	$999,893	Honolulu	HI
Low-Cost Wireless Voltage and Current	Inactive	2015	$500,000	Arnold	MD
Solarskin, Color-Match Solar Panels	Inactive	2015	$1,000,000	Cambridge	MA
Behind-The-Meter PV Data and Distribu	Inactive	2015	$499,894	Washingtor	DC
Magnetic Communication Network for S	Inactive	2015	$144,000	Calabasas	CA
Design to Build Automation and Optimi	Active	2015	$681,676	Davis	CA
An End-To-End System for Permit and Ir	Inactive	2015	$900,000	San Francis	CA
Software for Automatic Utility Data Coll	Inactive	2015	$762,530	Oakland	CA
Austin SHINES	Active	2015	$4,300,000	Austin	TX
Agent-Based Coordination Scheme for F	Active	2015	$1,036,963	Pittsburgh	PA
Microgrid-Integrated Solar-Plus-Storage	Active	2015	$4,000,000	Chicago	IL
Beneficial Integration of Energy Storage	Active	2015	$3,124,685	Knoxville	TN
Sundial - An Integrated System to Enabl	Active	2015	$3,493,921	Boston	MA
Integrating System to Edge-of-Network	Active	2015	$2,437,500	Honolulu	HI
Unique Single-Axis Tracking Planar Wav	Active	2016	$628,478	Boston	MA
CSP Based on Active Microfluidic Mirror	Inactive	2016	$1,750,000	Oakland	CA
Low-Cost Concentrated Solar Power Col	Active	2016	$1,483,299	La Jolla	CA
Green Parabolic Trough Collector Inspir	Active	2016	$1,740,564	Levermore	CA
Dielectric Metasurface Concentrators	Active	2016	$2,000,000	La Jolla	CA
Development of a Planar Focusing Colle	Active	2016	$1,381,879	Urbana	IL
Orange Button Phase 3 - Standardizing I	Active	2016	$1,000,000	San Francis	CA
Orange Button Phase 3 - Standardizing I	Active	2016	$400,000	Golden	CO
Orange Button Phase 1 - Convening Stal	Active	2016	$615,426	Boston	MA
Orange Button Phase 2 - Establishing Da	Active	2016	$1,638,765	Santa Clara	CA

A New Class of Tandems: Optically Cou	Inactive	2016	$213,335 Tempe	AZ
Sound Assisted Low Temperature (SALT	Inactive	2016	$222,519 Tempe	AZ
Interfacial Work Function Modifiers In F	Active	2016	$165,775 Cleveland	OH
Novel Approach to Front-Contact Passiv	Inactive	2016	$150,000 Fort Collins	CO
Low-Cost Nanostructured Substrates fo	Inactive	2016	$159,939 Mountain \	CA
Aluminum Epilayers for Controlled Grov	Inactive	2016	$179,003 Rapid City	SD
Green, Stable and Earth Abundant Ionic	Inactive	2016	$224,814 Buffalo	NY
Theoretical Design and Discovery of the	Inactive	2016	$225,000 Boulder	CO
Single-junction Organic Solar Cells with	Inactive	2016	$225,000 Gainsville	FL
Low-Cost III-V Photovoltaic Materials by	Active	2016	$225,000 Eugene	OR
Fifteen Percent Efficient (Magnesium, Z	Active	2016	$400,000 Tempe	AZ
Monolithic Silicon Module Manufacturi	Active	2016	$800,000 Tempe	AZ
Plant and Module Designs for Uniform ⁄	Active	2016	$899,316 Tempe	AZ
Pushing the Limits of Silicon Heterojunc	Active	2016	$837,044 Tempe	AZ
Solution for Predictive Physical Modelin	Active	2016	$812,998 Tempe	AZ
New Approaches to Low-Cost Scalable I	Active	2016	$615,000 Golden	CO
Device Architecture for Next-Generatio	Active	2016	$899,922 Fort Collins	CO
Pushing the Efficiency Limit of Low-Cost	Active	2016	$1,125,000 Atlanta	GA
Low-Cost Tool Design for Cell and Modu	Active	2016	$1,125,003 Boston	MA
Tandem Solar Cells: Pathway to Low-Co	Active	2016	$1,124,999 Columbus	OH
Continuous Silicon Reduction and Cons	Active	2016	$900,000 Menlo Park	CA
Crosscutting Recombination Metrology	Active	2016	$1,025,000 San Marco:	TX
Enabling Efficiencies Greater than 22.5 I	Active	2016	$1,125,000 Orlando	FL
Improved Performance and Reliability o	Active	2016	$800,000 Newark	DE
Rapid Patterning and Advanced Device :	Active	2016	$1,124,491 Newark	DE
Improving Reliability and Reducing Cost	Active	2016	$959,400 Chicgao	IL
Research and Development of Architect	Active	2016	$807,817 Ann Arbor	MI
Developing a Low-Cost, High-Volume ar	Active	2016	$1,124,992 Pullman	WA
Advancing Solar Innovation for Low- an	Active	2016	$729,995 Tempe	AZ
Understanding Adoption of a Key Soft C	Active	2016	$1,199,935 Oakland	CA
State Strategies to Bring Solar to Low- a	Active	2016	$1,730,000 Montpelier	VT
Modeling Photovoltaics Innovation and	Active	2016	$1,275,000 Cambridge	MA
Minnesota Solar Pathways: Illuminating	Active	2016	$1,999,964 St. Paul	MN
Montana Community-Scale Solar Strate	Active	2016	$380,000 Helena	MT
Unlocking Widespread Solar Adoption: I	Active	2016	$1,350,000 Golden	CO
Florida Alliance for Accelerating Solar ar	Active	2016	$1,750,000 Tallahassee	FL
Community Solar for the Southeast	Active	2016	$1,000,000 Raleigh	NC
Finding Pennsylvania's Solar Future	Active	2016	$550,000 Harrisburg	PA
Data-Driven Understanding of Low- to M	Active	2016	$816,090 Boston	MA
Machine Learning for Solar Technology	Active	2016	$699,940 Arlington	VA
Knowledge Spillovers and Cost Reductic	Active	2016	$1,250,000 Austin	TX
Coupled Social and Infrastructure Appro	Active	2016	$1,225,961 Blacksburg	VA
Solar Plus Strategies for Oregon and Wa	Active	2016	$2,050,000 Olympia	WA
Enhanced Distributed Solar Photovoltai	Active	2016	$2,020,000 Denver	CO
Using Behavioral Science to Target Low-	Active	2016	$1,350,000 New Haver	CT
Training for State Officials to Make Sola	Active	2016	$568,000 Montpelier	VT
Leveraging Industry Research to Educat	Active	2016	$1,000,000 Knoxville	TN

Training Real Estate Professionals to Fin	Active	2016	$445,027	Chicago	IL
Multimedia Solar Knowledge Library	Inactive	2016	$430,727	Washingtor	DC
Integration of Solar Training into Allied	Active	2016	$2,200,000	Albany	NY
State STEP Partnership and State Solar T	Active	2016	$950,615	Denver	CO
Personnel Certifications for the Design,	Active	2016	$1,119,195	Clifton Parl	NY
Solar Ready Vets	Inactive	2016	$1,947,730	Washingtor	DC
Solar Training for Design Professionals	Active	2016	$799,949	Oakland	CA
STEP/FEEDER: Strategic Expansion to Ac	Active	2016	$1,000,000	Orlando	FL
Next Generation Solar Finance	Inactive	2016	$490,390	Boston	MA
One Step Super Emitters for High Efficie	Active	2016	$2,000,000	Fayettevill	AR
Single Active Switch PV Inverter	Inactive	2016	$500,000	Raleigh	NC
Amicus O&M Cooperative	Inactive	2016	$358,013	Boulder	CO
High Throughput Epitaxial Growth Of Sil	Active	2016	$3,000,000	Santa Clara	CA
Creation of an Online B2B Platform Spe	Inactive	2016	$700,000	Rochester	MN
Scalable Direct-To-Consumer Communit	Inactive	2016	$1,250,000	Washingtor	DC
Achieving Ubiquitous Solar through Mai	Inactive	2016	$799,287	Hingham	MA
High penetration DER system forecastin	Active	2016	$700,000	Summit	NJ
Interplay Solar Training Platform: A Nev	Inactive	2016	$1,250,000	Del Mar	CA
Software Development: A Tool for Sma	Inactive	2016	$1,762,968	San Francis	CA
New Communications Link to Reduce R	Inactive	2016	$385,998	Santa Rosa	CA
High-Performance Bidirectional Inverte	Inactive	2016	$875,000	Westbrook	ME
Big Data Analytics and eCommerce for (	Active	2016	$1,000,000	San Francis	CA
Molten-Salt Tower Peaker Designed for	Active	2016	$799,981	Broomfield	CO
The SunGarden: DIY Solar for Widespre	Inactive	2016	$486,432	Hillsboro	OR
A Reliable and Low-Cost Monolayer Bac	Active	2016	$399,981	Scotts Valle	CA
Sunfolding Mass-Manufactured Tracker	Active	2016	$1,999,999	San Francis	CA
Innovative manufacturing technologies	Inactive	2016	$1,997,828	Norcross	GA
Advanced Manufacturing Toolset for Lo	Active	2016	$4,993,823	Sunnyvale	CA
Commercially Relevant Integrated Mod	Inactive	2016	$858,564	Cambridge	MA
In-Line Sensor for Inspection of Diamon	Inactive	2016	$582,469	Wesley Cha	FL
High-Performance Self-Cleaning, Antire	Active	2016	$679,413	Fayettevill	AR
Security Constrained Economic Optimiz	Active	2017	$3,241,628	San Francis	CA
Enhanced Control, Optimization, and In	Active	2017	$2,420,000	Golden	CO
Grid Optimization with Solar	Active	2017	$1,591,603	Golden	CO
Robust Distributed State Estimator for I	Active	2017	$633,792	Boston	MA
Keystone Solar Future Project	Active	2017	$3,320,000	Allentown	PA
Integration of Solar Energy into Power (	Inactive	2017	$1,500,000	Raleigh	NC
Voltage Regulation and Protection Assu	Active	2017	$2,500,000	Albuquerq	NM
Electric Access System Enhancement	Active	2017	$4,000,000	Rosemead	CA
Phasor-Based Control for Scalable Solar	Active	2017	$2,000,000	Berkeley	CA
Integration of a Distributed Energy Resc	Active	2017	$2,420,013	Riverside	CA
Scalable and Secure Cooperative Algorit	Active	2017	$2,000,000	Orlando	FL
Data Driven Modeling and Analytics for	Active	2017	$1,886,999	Los Angele	CA
Robust and Resilient Coordination of Fe	Active	2017	$1,774,134	Burlington	VT
Direct Metallization with Reactive Inks:	Active	2017	$1,400,000	Tempe	AZ
Electroplated Aluminum - An Alternativ	Active	2017	$225,000	Tempe	AZ
Fault-Tolerant, Shade-Tolerant High-Vol	Active	2017	$180,000	Tempe	AZ

Non-Contact Simultaneous String-Modu	Active	2017	$709,999	Tempe	AZ
Operando X-ray Nanocharacterization o	Active	2017	$1,600,000	Tempe	AZ
Sound Assisted Low Temperature Spalli	Active	2017	$709,999	Tempe	AZ
Improving Solar Panel Durability throug	Active	2017	$600,000	Westford	MA
Reliability and Power Degradation Rate:	Active	2017	$1,465,291	Cleveland	OH
Perovskite Solar Cells: Addressing Low C	Active	2017	$192,529	Golden	CO
Revealing the Mechanism of Light Induc	Active	2017	$225,000	Golden	CO
Advanced Module Architecture for Redi	Active	2017	$1,125,000	Fort Collins	CO
High Lifetime and Mobility Cadmium Te	Active	2017	$162,702	Fort Collins	CO
Direct Current Arc-Flash Safety for 1,50	Active	2017	$1,010,726	Charlotte	NC
Adhesive Mounting of Conventional Ph	Active	2017	$800,000	Boston	MA
Tunneling Back-Contacted Silicon Photo	Active	2017	$117,291	Bethlehem	PA
Two-Dimensional Material Based Layer	Active	2017	$225,000	Cambridge	MA
Enhanced Convection for Higher Modul	Active	2017	$800,000	Portland	OR
Single Model Characterization	Active	2017	$551,644	Larkspur	CA
Low-Cost Scaffold-Reinforced Perovskit	Active	2017	$225,000	Stanford	CA
Perovskite on Silicon Tandem Solar Cell	Active	2017	$1,365,306	Stanford	CA
Advanced Monolithic Interconnects	Inactive	2017	$956,630	San Jose	CA
Aligned Wire Metallization and Stringin	Active	2017	$1,200,000	San Jose	CA
Industrially Feasible, Dopant-Free Asym	Active	2017	$225,000	Berkeley	CA
Understanding and Overcoming Water-	Active	2017	$590,000	La Jolla	CA
Characterization of Contact Degradatio	Active	2017	$1,581,442	Orlando	FL
Levelized Cost of Energy Reduction thro	Active	2017	$1,599,821	Orlando	FL
Isovalent Alloying and Heterovalent Sub	Active	2017	$225,000	Boulder	CO
Spread Spectrum Time Domain Reflecti	Active	2017	$800,000	Salt Lake Cl	UT
sCO₂ Power Cycle with Int	Active	2017	$1,000,000	Akron	OH
The Democratization of Solar: Expandin	Active	2017	$800,000	Boston	MA
Low Cap-Ex, High Speed Roll-to-Roll Per	Active	2017	$2,000,000	Norcross	GA
An Online Marketplace that Allows Con	Active	2017	$1,600,000	Boston	MA
Brittle Fracture Wafering of Silicon Ingo	Active	2017	$1,073,288	San Mateo	CA
Krypton Shine	Active	2017	$885,711	San Francis	CA
Refinement of the Floating Silicon Meth	Active	2017	$1,500,000	Somerville	MA
Building Windows with Transparent Ph	Active	2017	$2,500,000	Santa Barb	CA
A Software Platform to Drive Disruptive	Active	2017	$796,810	Seattle	WA
Reliable and Secure Bidirectional Comm	Active	2017	$480,000	Santa Rosa	CA
Highly Efficient Steel Cable Solar Photov	Active	2017	$1,000,000	Carbondale	CO
Residential Property Assessed Clean En	Active	2017	$3,000,000	Oakland	CA
Ultra-Compact High Efficiency Multi-Lev	Active	2017	$922,693	Urbana	IL
Low-Cost Wireless Voltage and Current	Active	2017	$1,999,812	Arnold	MD
Design and Reliability Improvements fo	Active	2017	$1,600,000	Broomfield	CO
Re-Designing the Consentrating Solar P	Active	2017	$2,000,000	Santa Mon	CA
Cost-Efficient and Highly Weather-Resis	Active	2017	$443,120	Nashua	NH
Unlocking Utility Data to Address Solar I	Active	2017	$923,750	Oakland	CA

Rodriguez, Susan (CONTR)

From: Chalk, Steven
Sent: Wednesday, August 22, 2018 11:57 AM
To: Unruh, Timothy
Subject: RE: Solar FOA Stats

(b) (5)

From: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Date: Wednesday, Aug 22, 2018, 10:54 AM
To: Chalk, Steven <Steven.Chalk@ee.doe.gov>
Subject: FW: Solar FOA Stats

(b) (6)

(b) (5)

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

From: Tripodi, Cathy
Sent: Wednesday, August 22, 2018 9:10 AM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: RE: Solar FOA Stats

Tim:

(b) (6)

(b) (5)

(b) (5)

(b) (5)

Of note is this seams effort. (b) (5)

We put a process in place to ensure that the Program responsibly closes out the end of FY 18. (b) (5)

Please note that your colleagues are utilizing the process.

Thank you,
Cathy T.

From: Unruh, Timothy
Sent: Tuesday, August 21, 2018 10:13 AM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>
Subject: Solar FOA Stats

Friday, you requested some preliminary stats from the Solar FOA. You wanted to know how many applications we received on Topic 1 (in italics and underlined, below). Here is the information for the full FOA as well.

# of Applications Received:

- Entire FOA = (b) (5)
  - (b) (5)
  - o
  - o
  - o
  - o

Overall, they received (b) (5) Concept Papers initially.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

Doc 46

Rodriguez, Susan (CONTR)

From: Hamos, Ian
Sent: Thursday, August 23, 2018 9:28 AM
To: Unruh, Timothy
Subject: RE: Solar FOA Stats

Not sure if you have sent yet, but if you were asking for my eyes and thoughts on the email, I think this looks good.

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: Unruh, Timothy
Sent: Thursday, August 23, 2018 9:06 AM
To: Hamos, Ian <Ian.Hamos@EE.doe.gov>
Subject: RE: Solar FOA Stats

*****Ian, have not sent this anywhere, but wanted to document what really happened. Thanks **********

Thank you for the email. (b) (6)

Weekly Report:
(b) (6) (b) (6)

Solar FOA Topic 1:
I first brought up the Solar FOA in our meeting on July 23. At that time, you asked about the coordination of Topic 1 with the Office of Electricity. I was not aware of the details of the coordination, and you asked to have Katie Jereza come to a subsequent meeting for input on July 27. In that meeting we discussed not only the Solar FOA, but the Water FOA as well (Water Power FOA Topic 2.2 and Solar FOA Topic 1). Katie Jereza said she would go back to the program to seek guidance on coordination for the two topics. (b) (5)

On August 2, Katie cleared the Water Power FOA, but indicated she was still working on the Solar FOA. On August 6, I inquired of Katie if there was any language update from her team, and she indicated there was not. On that same day, you also replied to my request letting me know that Bruce Walker was working on a language update, and would have it to you by Wednesday (August 8).

From your email:
I spoke to Bruce Walker and he is working on the language. (b) (5)

Thanks.

On August 9, you indicated you and Bruce Walker were looking for me to discuss the language. (b) (6)
On August 15, I requested any input you had from Bruce Walker to the Solar FOA, as well as alerted you to the placement of 3 Office of Electricity members on the Federal Consensus Board for the selections of Topic 1 of the Solar FOA, per your request. (b) (5)

At that time, you had no further input from Bruce, and it was still unclear if he would see a need to make changes. (b) (5)

Thus, I informed the Solar program office leadership (Charlie Gay and Becca Jones-Albertus), but that until we knew if there would absolutely be changes, that we should continue the process.

The status today, is that I await recommended changes, if any from Bruce Walker, and that you are providing the interface to Bruce to receive those changes.

FOA Location:
In our one-on-one meeting on August 17, I reviewed the Geothermal Zonal Isolation FOA with you, (b) (5)
(b) (5)

I communicated with Bindu Jacobs that night, and she provided me the list of FOAs that you had received, with the Goethermal Zonal Isolation included on that list. I notified you that it was among the early group, but also provided a copy attached to the email (on August 21), and offered to provide you a brief on that FOA.

Selection Process Form:
The selection process form was provided to me by the Fuel Cells Office, as an example of the form that was used by that program in their briefing with you. The RP programs were informed to use this example in their development of briefing materials to you. We have provided this form to you for the 1-lab call I have briefed, and the 1 FOA selection I have briefed. You asked for additional information on both of these forms, which we are working to provide. However, (b) (5)
(b) (5)

Incomplete Explanations:
(b) (5)
, (b) (5)
On August 17, I provided you a preliminary topic replacement for the Offshore Wind FOA (Lightweight Rotors and Hubs), which you approved to proceed FOA development.

SEAMs study:
The SEAMs study is an analysis of the transmission system from the year 2026 through 2038. I viewed a technical presentation of preliminary results by an engineer on July 23. The study was funded by both EERE and OE. The OE funder was also present at the presentation. I checked on the policy of the office, and was told that conference presentations by laboratory personnel were not being reviewed by the front office of EERE. However, should a report or Journal article be created, it would need to be reviewed. Furthermore, I did not see that any policy recommendations were made in the presentation, nor was any conclusion stated in the presentation. It simply showed simulation results and outlined the process to develop the simulation.

Subsequent to the presentation, it was picked up by the press, (b) (5) I was informed in a meeting with you (b) (5) (b) (5)
Subsequent to that day, another engineer at the laboratory presented in Lawrence Kansas. (b) (5) I followed through with an email to Aaron Bloom (the lead engineer), David Mooney (his supervisor), and Martin Keller

(Laboratory Director). I also followed up with a call with Martin Keller the evening of August 14, and (b) (5)

Martin subsequently informed me that he was working with Alex Fitzsimmons directly about one of their engineers (b) (6) who was awarded a large prize and wanted to present the SEAMs preliminary results at the prize award ceremony. I have not been involved in that effort.

Process Closeout for FY18:
I stand ready to use any and all processes to close out the fiscal year.

Thanks.

Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

From: Tripodi, Cathy
Sent: Wednesday, August 22, 2018 9:10 AM
To: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: RE: Solar FOA Stats

Tim:

(b) (6)

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Cc: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Hamos, Ian <Ian.Hamos@EE.doe.gov>
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Timothy D. Unruh, Ph.D., PE, CEM, LEED AP
United States Department of Energy
Deputy Assistant Secretary – Renewable Power
1000 Independence Ave SW, Washington, DC 20585
(202) 586-2982

Rodriguez, Susan (CONTR)

From: Passarelli, Derek
Sent: Monday, August 27, 2018 2:35 PM
To: Unruh, Timothy
Subject: RE: FOA Topic 1

Please call me. 240-562-1600.

From: Unruh, Timothy
Sent: Monday, August 27, 2018 3:30 PM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: FW: FOA Topic 1

Dis you get any revised language? We have been waiting to see it.

From: "Gay, Charlie" <Charlie.Gay@EE.DOE.Gov>
Sent: Aug 27, 2018 5:07 PM
To: "Unruh, Timothy" <Timothy.Unruh@EE.Doe.Gov>
Cc: "Hamos, Ian" <Ian.Hamos@EE.doe.gov>
Subject: FW: FOA Topic 1

fyi

- Charlie
202-287-1987

From: Yuan, Guohui
Sent: Monday, August 27, 2018 5:01 PM
To: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Subject: FW: FOA Topic 1

From: Bobo, Diana <Diana.Bobo@ee.doe.gov>
Date: Monday, Aug 27, 2018, 4:28 PM
To: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>, Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Cc: Pfrangle, Clay <Clay.Pfrangle@EE.Doe.Gov>
Subject: FOA Topic 1

Hi Kyle and Guohui,

Derek Passarelli just informed me that Kathy Tripodi is seeking to revise Topic 1 of the FOA and re-post. Are you available tomorrow to discuss the proposed language?

Thanks,
Diana

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Monday, August 27, 2018 3:04 PM
To: Yuan, Guohui;Gay, Charlie
Subject: RE: SETO FY18 FOA

Thanks, Guohui. (b) (5)

Becca

From: Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Date: Monday, Aug 27, 2018, 5:09 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>, Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: FW: SETO FY18 FOA

FYI. I'm driving... will look at it when I get home.

From: Bobo, Diana <Diana.Bobo@ee.doe.gov>
Date: Monday, Aug 27, 2018, 5:01 PM
To: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>, Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Cc: Pfrangle, Clay <Clay.Pfrangle@EE.Doe.Gov>
Subject: FW: SETO FY18 FOA

Please see attached proposed new language for Topic 1.

Thank you,
Diana

-----Original Message-----
From: Passarelli, Derek
Sent: Monday, August 27, 2018 2:59 PM
To: Bobo, Diana <Diana.Bobo@ee.doe.gov>
Subject: RE: SETO FY18 FOA

Attached is the proposed new language for Topic Area 1. Take a look at it and let's discuss.

-----Original Message-----
From: Bobo, Diana
Sent: Monday, August 27, 2018 2:56 PM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: SETO FY18 FOA

Hi Derek,

Please find attached the SETO FY18 FOA.

Thank you,
Diana

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Tuesday, August 28, 2018 7:09 AM
To: Walter, David
Subject: FW: SETO FY18 FOA
Attachments: Misc1.docx

From: Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Date: Monday, Aug 27, 2018, 5:09 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>, Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: FW: SETO FY18 FOA

FYI. I'm driving... will look at it when I get home.

From: Bobo, Diana <Diana.Bobo@ee.doe.gov>
Date: Monday, Aug 27, 2018, 5:01 PM
To: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>, Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>
Cc: Pfrangle, Clay <Clay.Pfrangle@EE.Doe.Gov>
Subject: FW: SETO FY18 FOA

Please see attached proposed new language for Topic 1.

Thank you,
Diana

-----Original Message-----
From: Passarelli, Derek
Sent: Monday, August 27, 2018 2:59 PM
To: Bobo, Diana <Diana.Bobo@ee.doe.gov>
Subject: RE: SETO FY18 FOA

Attached is the proposed new language for Topic Area 1. Take a look at it and let's discuss.

-----Original Message-----
From: Bobo, Diana
Sent: Monday, August 27, 2018 2:56 PM
To: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Subject: SETO FY18 FOA

Hi Derek,

Please find attached the SETO FY18 FOA.

Thank you,
Diana

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.

Rodriguez, Susan (CONTR)

From: Jones-Albertus, Becca
Sent: Tuesday, August 28, 2018 6:21 PM
To: Gay, Charlie;DL-EERE-4S PMsolar;Unruh, Timothy
Cc: Hamos, Ian;Fricker, Kyle;Kane, Victor;Murley, Susanna (CONTR)
Subject: RE: SETO FOA Topic 1 Cancellation Notice

At some point, we should also craft a letter to send to the roughly 30 merit reviewers who sent many days of their time reviewing the topic 1 applications.

Becca

From: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Date: Tuesday, Aug 28, 2018, 7:58 PM
To: DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>, Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Cc: Hamos, Ian <Ian.Hamos@EE.doe.gov>, Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>, Kane, Victor <Victor.Kane@EE.Doe.Gov>, Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Subject: FW: SETO FOA Topic 1 Cancellation Notice

FYI

- Charlie
202-287-1987

From: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Date: Tuesday, Aug 28, 2018, 7:28 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>, Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: SETO FOA Topic 1 Cancellation Notice

Cathy, Alex and Charlie,

Per my discussion with Cathy, (b) (5)

(b) (5)

Charlie, (b) (5)

Cathy and Alex, (b) (5)

If any of you have questions about this process, please let me know.

Thank you.

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: Wednesday, August 29, 2018 4:47 AM
To: Unruh, Timothy
Subject: RE: SETO FOA Topic 1 Cancellation Notice

Certainly. I'm on my way in now.

From: Unruh, Timothy <Timothy.Unruh@EE.Doe.Gov>
Date: Wednesday, Aug 29, 2018, 6:41 AM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>
Subject: FW: SETO FOA Topic 1 Cancellation Notice

I have an idea that I think is a win all around on this. I can talk to you this morning if you are interested.

From: "Gay, Charlie" <Charlie.Gay@EE.DOE.Gov>
Sent: Aug 28, 2018 7:58 PM
To: DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>; "Unruh, Timothy" <Timothy.Unruh@EE.Doe.Gov>
Cc: "Hamos, Ian" <Ian.Hamos@EE.doe.gov>; "Fricker, Kyle" <Kyle.Fricker@EE.DOE.Gov>; "Kane, Victor" <Victor.Kane@EE.Doe.Gov>; "Murley, Susanna (CONTR)" <Susanna.Murley@EE.DOE.Gov>
Subject: FW: SETO FOA Topic 1 Cancellation Notice

FYI

- Charlie
202-287-1987

From: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Date: Tuesday, Aug 28, 2018, 7:28 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>, Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, Gay, Charlie <Charlie.Gay@EE.DOE.Gov>
Subject: SETO FOA Topic 1 Cancellation Notice

Cathy, Alex and Charlie,

Per my discussion with Cathy, (b) (5)

(b) (5)

Charlie,(b) (5)

(b) (5)

Cathy and Alex, (b) (5)

If any of you have questions about this process, please let me know.

Thank you.

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: Jones-Albertus, Becca
Sent: Wednesday, August 29, 2018 10:24 AM
To: Fricker, Kyle
Subject: RE: merit review costs

Thanks!

From: Fricker, Kyle
Sent: Wednesday, August 29, 2018 1:06 PM
To: Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Subject: merit review costs

(b) (5) (to be paid to reviewers for Topic 1 reviews)

Kyle J Fricker, PhD
Solar Energy Technologies Office
U.S. Department of Energy
(202) 287-1909
kyle.fricker@ee.doe.gov

(b) (5)

Rodriguez, Susan (CONTR)

From: Murley, Susanna (CONTR)
Sent: Wednesday, August 29, 2018 11:51 AM
To: Jones-Albertus, Becca
Subject: FW: Weekly Update - Financial Assistance Work Plans
Attachments: Work Plan for Approved FOAs - EERE 8-22-2018_internal.xlsx

Hi Becca –

The MA work plan needs to be updated with the new information on the SETO FOA. See changes proposed in red. Since this is sensitive I thought I'd get your approval before I sent it. However, it's due today.

#	FOA #	FOA Name / Brief Description	$ Value (Estimated or Actual)	# Selections (Estimated or Actual)	Fiscal Year Funding	Type	DOE Points of Contact	Status of FOA Process	Comms. Plan Summary (FOA)	Date FOA Release
10	DE-FOA-0001840	Solar Energy Technologies Office FY18 Funding Opportunity Announcement	(b) (5)		FY18	FOA	Dr. Charles Gay	(b) (5)	Already completed at time of Work Plan format change	4/17/2018

Best,

Susanna

Susanna Murley
Strategic Support Team Lead
The Building People, LLC | U.S. Department of Energy
Contractor supporting the Solar Energy Technologies Office
Office of Energy Efficiency and Renewable Energy
Office: 202.287.1637 | Cell: (b) (6)

From: Singsen, Jeannette
Sent: Tuesday, August 21, 2018 9:37 AM
To: DL-EERE Operations Council <DL-EEREOperationsCouncil@EE.Doe.Gov>
Cc: Carabajal, Stephanie <Stephanie.Carabajal@ee.Doe.Gov>; Zeh, Charles (NETL) <charles.zeh@netl.doe.gov>; Hinkle, Harold (NETL) <harold.hinkle@netl.doe.gov>; Kennedy, Melinda <melinda.kennedy@netl.doe.gov>; Crooms, Andrea <Andrea.Crooms@ee.doe.gov>; Cabaniss, John <John.Cabaniss@ee.doe.gov>; Garson, Jennifer <Jennifer.Garson@EE.doe.gov>; Roy, Molly <Molly.Roy@ee.Doe.Gov>; Morrison, Daniel <Daniel.Morrison@ee.doe.gov>; Barendsen, Eric <Eric.Barendsen@ee.doe.gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Wahlert, Kayt <Kayt.Wahlert@ee.Doe.Gov>; Peralta, Kara Houston <KaraHouston.Peralta@ee.doe.gov>; Pezzullo, Leslie <Leslie.Pezzullo@ee.doe.gov>; Buck, Michael <Michael.Buck@ee.doe.gov>; Kouch, Tina <Christina.Kouch@ee.doe.gov>; Gomes, Luke <Luke.Gomes@EE.Doe.Gov>; Anderson, Sid <Sid.Anderson@em.doe.gov>; Pearce, Casey <Casey.Pearce@ee.doe.gov>; Hartman, Liz

<Liz.Hartman@ee.doe.gov>; Burgess, Marilyn <Marilyn.Burgess@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Hayes, Philip <Philip.Hayes@ee.doe.gov>; Wozniak, Genevieve <Genevieve.Wozniak@EE.Doe.Gov>
Subject: Weekly Update - Financial Assistance Work Plans

Operations Supervisors,

Please send me any weekly updates to the Work Plan for Approved FOAs by noon tomorrow (Wednesday).

I have attached an updated version of the Work Plan for your review and edit.

Thank you!

Jeannette Singsen
Project Management Coordination Office (PMCO)
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Phone: 240-562-1782

Join PMCO for the Project Management Workshop Series
Details on PM Central: http://eere-intranet2.ee.doe.gov/APMC/apm-workshop-series

PMCO provides Project Management analytical support, tools and training. Contact us at PMhelpdesk@ee.doe.gov

PMCO Leads the Federal Program and Project Management Community of Practice
FedPM CoP is the central source for best practices in federal program and project management
Website via OMB MAX: https://go.max.gov/fedpmcop

Rodriguez, Susan (CONTR)

From: Jacob, Bindu
Sent: Thursday, August 30, 2018 10:50 AM
To: Hamos, Ian
Cc: Unruh, Timothy;Gay, Charlie;Pezzullo, Leslie
Subject: RE: Solar FOA Topic 1 Cancelation and Re-release

That is a good question. Let me look into that.

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: Kane, Victor
Sent: Thursday, August 30, 2018 11:17 AM
To: Gay, Charlie;DL-EERE-4S PMsolar
Cc: Fricker, Kyle;Goldstone, Michael
Subject: RE: Solar FOA Topic 1 Cancelation and Re-release

HI Charlie,(b) (5)
Bindu or others may have already done this though. I defer to what others believe is best on this.

Best,
Victor

From: Gay, Charlie
Sent: Thursday, August 30, 2018 2:13 PM
To: DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Cc: Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>
Subject: FW: Solar FOA Topic 1 Cancelation and Re-release

fyi

- Charlie
202-287-1987

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: Gay, Charlie
Sent: Thursday, August 30, 2018 1:44 PM
To: Rench-McCauley, Dave (FELLOW)
Cc: Nilsen, Garrett;Jones-Albertus, Becca
Subject: RE: Topic 1 Rewrite Comparison

Thanks Dave !

... very informative and greatly appreciated !

- Charlie
202-287-1987

From: Rench-McCauley, Dave (FELLOW)
Sent: Thursday, August 30, 2018 4:30 PM
To: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>; Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Cc: Nilsen, Garrett <Garrett.Nilsen@ee.doe.gov>
Subject: Topic 1 Rewrite Comparison

Hi Charlie,

I just finished the comparison of reviewer lists for the Topic 1 Rewrite vs. Original text. You can find the results in the attached spreadsheet. Just like I did for the FOA, I limited the reviewer pool to those who are based out of the US (although you may note that a number of the recommendations are people from non-US organizations, probably around 10% - for some reason Dimensions has trouble sorting this properly, something we saw earlier for the FOA too). The "Original" tab is the top 100 reviewer candidates for the original wording of the Topic 1 text, and "Rewritten" is the same for the new text.

I also provided the Concept Panels as images for each of these documents, as those are a high-level reflection of the topics/concepts the text in question is reflecting. As you can see, there are very few similarities between the two, even with this crude measure (note the lack of the word "grid" in the rewritten version – a Find operation shows that it only appears twice in the rewritten version vs. 36 times in the original).

Long story short; there are 19 overlapping names in the two top-100 lists. Please let me know if you have any other questions in this regard.

--

Dave Rench McCauley, Ph.D.
Senior Program Associate | ManTech International Corporation
Contractor to the Solar Energy Technologies Office, U.S. Department of Energy
Dave.Rench-McCauley@ee.doe.gov | office: 202-287-1434

Rodriguez, Susan (CONTR)

From: Yuan, Guohui
Sent: Friday, August 31, 2018 5:35 AM
To: Gay, Charlie;Jones-Albertus, Becca
Subject: RE: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hi Charlie,

Thanks for sharing. I suspect there might not be much we can do here, but I still want to raise a few concerns from the SI team regarding how to execute the new FOA. The first is (b) (5)

Second, (b) (5) That's also part of our job and what the team is proud of doing. (b) (5) And lastly, (b) (5)

Let's strategize more on the next steps.

Guohui

From: Gay, Charlie
Sent: Thursday, August 30, 2018 7:43 PM
To: DL-EERE-4S PMsolar <DL-EERE-4SPMSolar@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

FYI

- Charlie
202-287-1987

From: Horst, John <john.horst@ee.doe.gov>
Date: Thursday, Aug 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>, EERE Stakeholder Engagement <EERE Stakeholder Engagement@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. SETO plans to post the NOI at the conclusion of this 24-hour sensitivity check. Please reply all with any questions, comments, or concerns.

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: Tripodi, Cathy
Sent: Friday, August 31, 2018 12:40 PM
To: Fitzsimmons, Alexander
Subject: RE: Solar FOA

Thank you!

From: Fitzsimmons, Alexander
Sent: Friday, August 31, 2018 3:18 PM
To: Tripodi, Cathy <Cathy.Tripodi@hq.doe.gov>
Subject: FW: Solar FOA

From: Passarelli, Derek <Derek.Passarelli@ee.doe.gov>
Date: Friday, Aug 31, 2018, 3:05 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>, Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA

The NOI has been posted on EERE Exchange. Below is the link.
https://eere-exchange.energy.gov/default.aspx#FoaId2bbe24fe-f075-4d1b-8ab7-0df723807696

The Notices have been sent via email.

Please let me know if you have any questions.

Derek

From: Passarelli, Derek
Sent: Friday, August 31, 2018 12:57 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA

We are issuing the Notices and posting the NOI in 5 minutes. I am giving the CO the final approval to proceed.

From: Passarelli, Derek
Sent: Friday, August 31, 2018 12:23 PM
To: Fitzsimmons, Alexander <Alexander.Fitzsimmons@ee.doe.gov>; Jacob, Bindu <Bindu.Jacob@ee.doe.gov>
Subject: RE: Solar FOA

We received 367 concept papers under Topic Area 1. If we don't include the 92 entities who went on to apply, we would be sending the notice to an additional 275 applicants. We would change the notice that was sent to the 275 entities to state: On behalf of the Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), we would like to thank you for submitting a concept paper . . ."

Rather than the language we will send to the applicants:

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** . . ."

We would send the notice to those entities that submitted concept papers at the same time as the notice to the applicants and the posting of the NOI. If you have any concerns or different direction, let me know.

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:	Gay, Charlie
Sent:	Friday, August 31, 2018 12:58 PM
To:	Anderson, Christopher;Bing, Christine;Bob, Brion;Fricker, Kyle;Goldstone, Michael;Golnas, Anastaslos;Graves, Andrew;Jones-Albertus, Becca;Kane, Victor;Mapes, Marie;Mikrut, Jeremey;Miller, Jeremiah;Nilsen, Garrett;Olson, Dana;Philipsen, Christian;Rueckert, Thomas;Shultz, Avi;Stricker, Daniel;Tinker, Lenny;Ulrich, Elaine;Vauss, Ebony;Vijaykumar, Rajgopal;Walter, David;Yuan, Guohui;Bobo, Diana;Pfrangle, Clay;Bauer, Matthew (CONTR);Baylor, Meisha (CONTR);Boyd, Michele A. (CONTR);Bristol, Jennifer (CONTR);Celik, Kemal (CONTR);Clark, Patricia (CONTR);Collins, Shamara (FELLOW);Dawson, Andrew (CONTR);Ebers, Anna (FELLOW);Ferguson, Jamal (CONTR);Huang, Susan (CONTR);Ihly, Rachelle (FELLOW);Irwin, Levi (CONTR);Jaishankar, Shubha (CONTR);Jones, Tiffany (CONTR);Kozinsky, Inna (CONTR);Krishnaswami, Hariharan (FELLOW);Lausten, Mark (CONTR);Machin, Sarah (CONTR);Marchetti, Emily (CONTR);Mees, Jacob (CONTR);Murley, Susanna (CONTR);Pecora, Emanuele F. (FELLOW);Prescod, Andru (CONTR);Qusaibaty, Ammar (CONTR);Rench-McCauley, Dave (FELLOW);Sheoran, Manav (CONTR);Truong, Nancy (CONTR);Washelesky, Dawn (CONTR);Zibulsky, Leah (CONTR)
Subject:	Follow-up
Attachments:	SETO FOA Topic Area 1 Notice with NOI 20180831 Final.docx

Hi Team:

Further to this morning's get-together, here's an update:

Notice of Intent (NOI) and topic revision

- History: In April 2018, U.S. Secretary of Energy Rick Perry issued a press release announcing the Solar Energy Technologies Office (SETO) Fiscal Year 2018 funding opportunity announcement (FOA). The FOA identified four topics including one (Topic Area 1) to advance research on technologies enabling integration of solar energy onto the nation's electricity grid. The office had budgeted $46 million anticipating about 14 projects. The FOA stated that the expected timeframe for selection notifications was September 2018.
- Upon review, the Office of Energy Efficiency and Renewable Energy (EERE) determined it appropriate to revise Topic Area 1 and issue a new FOA. A NOI has been posted on EERE Exchange. https://eere-exchange.energy.gov/default.aspx#Foaid2bbe24fe-f075-4d1b-8ab7-0df723807696
- Notices have been sent via email to Topic Area 1 applicants. (see attachment)

Communication

- As with all funding opportunities, one should not provide any privileged or confidential information that might give an interested party / potential awardee advantaged information. (note: Washington, D.C. law does not require two-party consent for recording phone calls.)
- Public Affairs is the point of contact for any inquiries.
  - John Horst
  - Email: John.horst@ee.doe.gov
    Phone: 1-720-356-1580
- FOA Questions
  - SETO.FOA@ee.doe.gov
- Exchange Help
  - EERE-ExchangeSupport@Hq.Doe.Gov

- Charlie
202-287-1987

From: Gay, Charlie
Sent: Friday, August 31, 2018 7:19 AM
To: Anderson, Christopher <Christopher.Anderson@EE.DOE.Gov>; Bing, Christine <Christine.Bing@ee.doe.gov>; Bob, Brion <Brion.Bob@EE.DOE.Gov>; Fricker, Kyle <Kyle.Fricker@EE.DOE.Gov>; Goldstone, Michael <Michael.Goldstone@ee.doe.gov>; 'Golnas, Anastasios (CONTR) (Tassos.Golnas@ee.doe.gov)' <Tassos.Golnas@ee.doe.gov>; Graves, Andrew <Andrew.Graves@EE.Doe.Gov>; 'Becca Jones-Albertus (Becca.Jones-Albertus@ee.doe.gov)' <Becca.Jones-Albertus@ee.doe.gov>; Kane, Victor <Victor.Kane@EE.Doe.Gov>; Mapes, Marie <Marie.Mapes@ee.doe.gov>; Mikrut, Jeremey <Jeremey.Mikrut@ee.doe.gov>; Miller, Jeremiah <Jeremiah.Miller@ee.doe.gov>; 'Nilsen, Garrett (CONTR) (Garrett.Nilsen@ee.doe.gov)' <Garrett.Nilsen@ee.doe.gov>; Olson, Dana <Dana.Olson@Hq.Doe.Gov>; Philipsen, Christian <Christian.Philipsen@ee.Doe.Gov>; Rueckert, Thomas <Thomas.Rueckert@ee.doe.gov>; 'Avi Shultz (Abraham.Shultz@EE.Doe.Gov)' <Abraham.Shultz@EE.Doe.Gov>; Stricker, Daniel <Daniel.Stricker@EE.Doe.Gov>; Tinker, Lenny <Lenny.Tinker@ee.Doe.Gov>; 'Ulrich, Elaine' <Elaine.Ulrich@ee.Doe.Gov>; 'Ebony Vauss (Ebony.Vauss@ee.doe.gov)' <Ebony.Vauss@ee.doe.gov>; Vijaykumar, Rajgopal <Rajgopal.Vijaykumar@EE.Doe.Gov>; Walter, David <David.Walter@ee.doe.gov>; Yuan, Guohui <Guohui.Yuan@EE.Doe.Gov>; Bobo, Diana <Diana.Bobo@ee.doe.gov>; Pfrangle, Clay <Clay.Pfrangle@EE.Doe.Gov>; Bauer, Matthew (CONTR) <Matthew.Bauer@EE.DOE.Gov>; Baylor, Melsha (CONTR) <Melsha.Baylor@EE.DOE.Gov>; Boyd, Michele A. (CONTR) <Michele.Boyd@ee.doe.gov>; Bristol, Jennifer (CONTR) <Jennifer.Bristol@EE.doe.gov>; Celik, Kemal (CONTR) <Kemal.Celik@EE.DOE.Gov>; Clark, Patricia (CONTR) <Patricia.Clark@EE.DOE.Gov>; Collins, Shamara (FELLOW) <shamara.collins@ee.doe.gov>; Dawson, Andrew (CONTR) <Andrew.Dawson@ee.doe.gov>; Ebers, Anna (FELLOW) <Anna.Ebers@ee.doe.gov>; Ferguson, Jamal (CONTR) <Jamal.Ferguson@ee.doe.gov>; Huang, Susan (CONTR) <Susan.Huang@EE.Doe.Gov>; Ihly, Rachelle (FELLOW) <Rachelle.Ihly@ee.doe.gov>; Irwin, Levi (CONTR) <Levi.Irwin@EE.Doe.Gov>; Jaishankar, Shubha (CONTR) <Shubha.Jaishankar@EE.Doe.Gov>; Jones, Tiffany (CONTR) <Tiffany.Jones@ee.doe.gov>; Kozinsky, Inna (CONTR) <Inna.Kozinsky@EE.Doe.Gov>; Krishnaswami, Hariharan (FELLOW) <Hariharan.Krishnaswami@EE.doe.gov>; Lausten, Mark (CONTR) <Mark.Lausten@ee.doe.gov>; Machin, Sarah (CONTR) <Sarah.Machin@EE.doe.gov>; Marchetti, Emily (CONTR) <Emily.Marchetti@EE.Doe.Gov>; Mees, Jacob (CONTR) <Jacob.Mees@EE.Doe.Gov>; Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>; Pecora, Emanuele F. (FELLOW) <Emanuele.Pecora@EE.DOE.Gov>; Prescod, Andru (CONTR) <Andru.Prescod@EE.Doe.Gov>; Qusaibaty, Ammar (CONTR) <Ammar.Qusaibaty@ee.Doe.Gov>; Rench-McCauley, Dave (FELLOW) <Dave.Rench-McCauley@ee.doe.gov>; Sheoran, Manav (CONTR) <Manav.Sheoran@EE.DOE.Gov>; Truong, Nancy (CONTR) <Nancy.Truong@EE.Doe.Gov>; Washelesky, Dawn (CONTR) <Dawn.Washelesky@EE.DOE.Gov>; Zibulsky, Leah (CONTR) <leah.zibulsky@ee.doe.gov>
Subject: FW: 24-hour sensitivity check for: SETO's Advanced Solar Systems Integration Technologies Notice of Intent

Hi Team:

Below and attached is a copy of the most recent action regarding the FOA – please do not forward. We will discuss at our 10:30 a.m. meeting.

- Charlie
202-287-1987

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. SETO plans to post the NOI at the conclusion of this 24-hour sensitivity check. Please reply all with any questions, comments, or concerns.

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.

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: Jones-Albertus, Becca
Sent: Friday, August 31, 2018 5:18 PM
To: Murley, Susanna (CONTR);Gay, Charlie
Subject: RE: phone calls

Thank you for those updates, Susanna. Let's discuss further when we meet on Tuesday.

Becca

From: Murley, Susanna (CONTR) <Susanna.Murley@EE.DOE.Gov>
Date: Friday, Aug 31, 2018, 3:09 PM
To: Gay, Charlie <Charlie.Gay@EE.DOE.Gov>, Jones-Albertus, Becca <Becca.Jones-Albertus@ee.doe.gov>
Subject: phone calls

Hi Charlie, Becca –

I just had a series of three calls that I wanted you to be aware of.

(b) (5)

Then John Horst called me. I had given him a call to let him know that we were told to put him as the point of contact for all questions. He appreciated the heads up.

(b) (5)

She is also going to be out next week and no one has been identified as her backup.

(b) (5)

Best,

Susanna

Susanna Murley
Strategic Support Team Lead
The Building People, LLC | U.S. Department of Energy
Contractor supporting the Solar Energy Technologies Office
Office of Energy Efficiency and Renewable Energy
Office: 202.287.1637 | Cell: (b) (6)

Rodriguez, Susan (CONTR)

From: Vonglis, John G.
Sent: Friday, August 31, 2018 5:22 PM
To: Shimek, Jaime
Cc: Forcier, Bridget;Johns, Christopher;Hanson, Chistopher
Subject: RE: Solar FOA Change

Jaime,

Will look into it.

John

John G. Vonglis
Chief Financial Officer
U.S. Department of Energy
Washington, D.C. 20583
(202) 586-4171

From: Shimek, Jaime <Jaime.Shimek@mail.house.gov>
Date: Friday, Aug 31, 2018, 8:12 PM
To: Vonglis, John G. <John.Vonglis@hq.doe.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>, Johns, Christopher <Christopher.Johns@Hq.Doe.Gov>, Hanson, Chistopher <Christopher_Hanson@appro.senate.gov>
Subject: Solar FOA Change

John,

We received the below information about a change to the Solar FOA for Advanced Systems Integration Technologies.

I understand that under the original FOA, career DOE officials had selected $40 million worth of projects. I'm told that DOE now intends to cancel those and make the applicants folks re-compete under altered terms.

We are going to need a full briefing from the Department BEFORE anything is done to cancel, postpone, and/or put a hold on any of the $40 million in projects that were originally selected under the original FOA, and BEFORE anything is done to put out a new FOA.

The way the notification below is worded did not give us any insight into what really happened here – which appears to be that $40 million worth of awards had already been selected and were probably going through some stage of the pre-award negotiation process. We consider this important information, which I would hope the Department did not leave out intentionally.

Again, we expect a briefing before ANY action is taken on this FOA or altered FOA.

Jaime

From: Shimek, Jaime
Sent: Friday, August 31, 2018 4:39 PM
To: 'Renfro, Mindy L' <renfroml@id.doe.gov>; Giancarlo, Angie <Angie.Giancarlo@mail.house.gov>; Yates, Perry <Perry.Yates@mail.house.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: SOLAR ENERGY TECHNOLOGY OFFICE FOA CHANGE

EERE should not do anything publicly or formally with this until we understand what is happening here.

From: Renfro, Mindy L [mailto:renfroml@id.doe.gov]
Sent: Friday, August 31, 2018 4:38 PM
To: Shimek, Jaime <Jaime.Shimek@mail.house.gov>; Giancarlo, Angie <Angie.Giancarlo@mail.house.gov>; Yates, Perry <Perry.Yates@mail.house.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: SOLAR ENERGY TECHNOLOGY OFFICE FOA CHANGE

I need to double check. I'll get back to you with an answer.

From: Shimek, Jaime <Jaime.Shimek@mail.house.gov>
Sent: Friday, August 31, 2018 4:36 PM
To: Renfro, Mindy L <renfroml@id.doe.gov>; Giancarlo, Angie <Angie.Giancarlo@mail.house.gov>; Yates, Perry <Perry.Yates@mail.house.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: RE: SOLAR ENERGY TECHNOLOGY OFFICE FOA CHANGE

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

From: Renfro, Mindy L [mailto:renfroml@id.doe.gov]
Sent: Friday, August 31, 2018 2:37 PM
To: Giancarlo, Angie <Angie.Giancarlo@mail.house.gov>; Yates, Perry <Perry.Yates@mail.house.gov>; Shimek, Jaime <Jaime.Shimek@mail.house.gov>
Cc: Forcier, Bridget <Bridget.Forcier@hq.doe.gov>
Subject: SOLAR ENERGY TECHNOLOGY OFFICE FOA CHANGE

I just wanted to let you know that the Office of Energy Efficiency and Renewable Energy (EERE) Solar Energy Technology Office (SETO) will be sending out notices to applicants of FOA-0001840 to notify them of a change to Topic Area 1 of the Funding Opportunity Announcement (FOA), Advanced Solar Systems Integration Technologies. Due to this revision, EERE plans to issue a new FOA. Applicants will be informed that if they would like to apply to the revised Topic Area 1 an application must be submitted under the new FOA.

I'm attaching the notice applicants will be receiving. As you will see in the attachment the notices will also contain the Notice of Intent to issue the updated FOA (DE-FOA-0001987).

Please let me know if you have any questions. Thanks!!!

Mindy Renfro
External Coordination
CFO Office of Budget
US Department of Energy

202-586-3260