SunShot
U.S. Department of Energy

Solar Desalination Funding Opportunity Announcement

energy.gov/sunshot

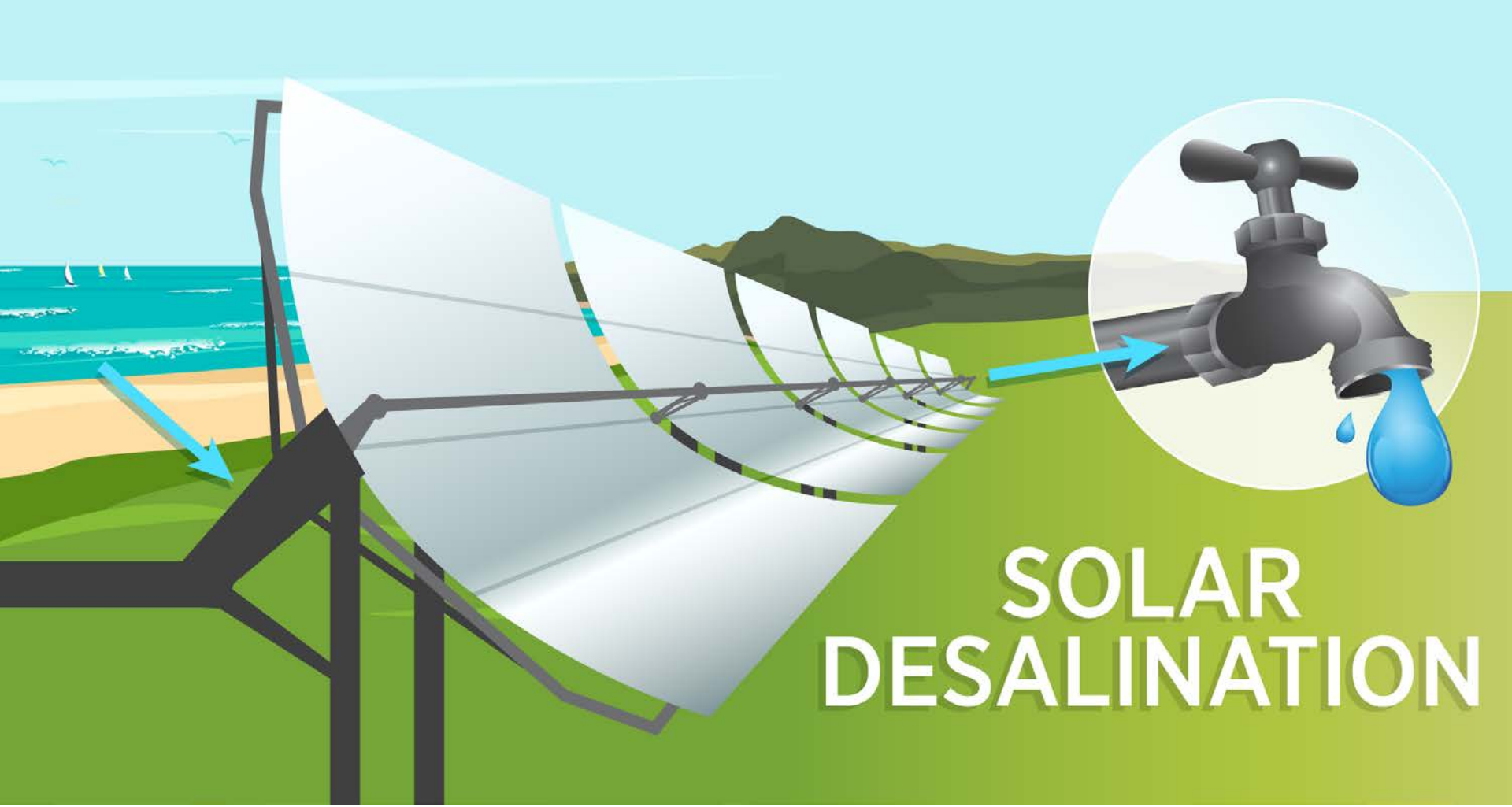
October 12, 2017

Solar Energy Technologies Office
Concentrating Solar Power

None of the information presented here is legally binding. The content included in this presentation is intended only to summarize the contents of funding opportunity DE-FOA-0001778. Any content within this presentation that appears discrepant from the Funding Opportunity Announcement (FOA) language is superseded by the FOA language. All Applicants are strongly encouraged to carefully read the FOA guidelines and adhere to them. Neither the U.S. Department of Energy (DOE) nor the employees associated with DOE working on this presentation shall be held liable for errors committed by Applicants based on potentially incorrect or inaccurate information presented herein.

Agenda

- Solar Desalination FOA Overview
- Solar Desalination Systems Funding Opportunity Announcement
  - Cost targets
  - Requested scope of proposed research and development
  - Topic areas
- Concept Paper Information
- Application, Review, and Selection Timeline
- Questions



- This FOA is Focused on solar **thermal** desalination
- Solar technology uses collectors to concentrate sunlight on receivers which converts photons into heat
- In order to be competitive with Reverse Osmosis, further reductions in capital cost and energy cost (and increased energy efficiency) are required

Cost Targets for Solar Desalination

- Solar Thermal Desalination FOA Focuses on Two Cost Targets:
  - LCOW = Levelized Cost of Water, $/m^3
  - LCOH = Levelized Cost of Heat, $/kWh$_{th}$
- $$LCOW = \frac{\text{Total lifetime costs (capital,financial,O\&M)}}{\text{Total lifetime clean water generation}}$$
- $$LCOH = \frac{\text{Total lifetime costs (capital,financial,O\&M)}}{\text{Total lifetime thermal generation}}$$

Cost Targets for Solar Thermal Desalination

- Cost targets for large and small capacity thermal desalination plants

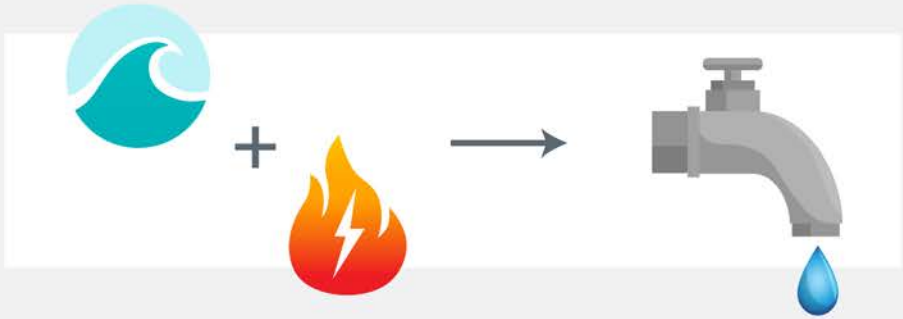
Capacity	Feedwater salinity (TDS)	LCOW Target ($/m^3)
Large (>10,000 m^3/day)	> 30,000 ppm	0.50
Small (<2000 m^3/day)	> 100,000 ppm	1.50*

* small-scale systems should target Zero Liquid Discharge (ZLD)

Solar Desalination FOA Topic Areas

TOPIC AREA 1:

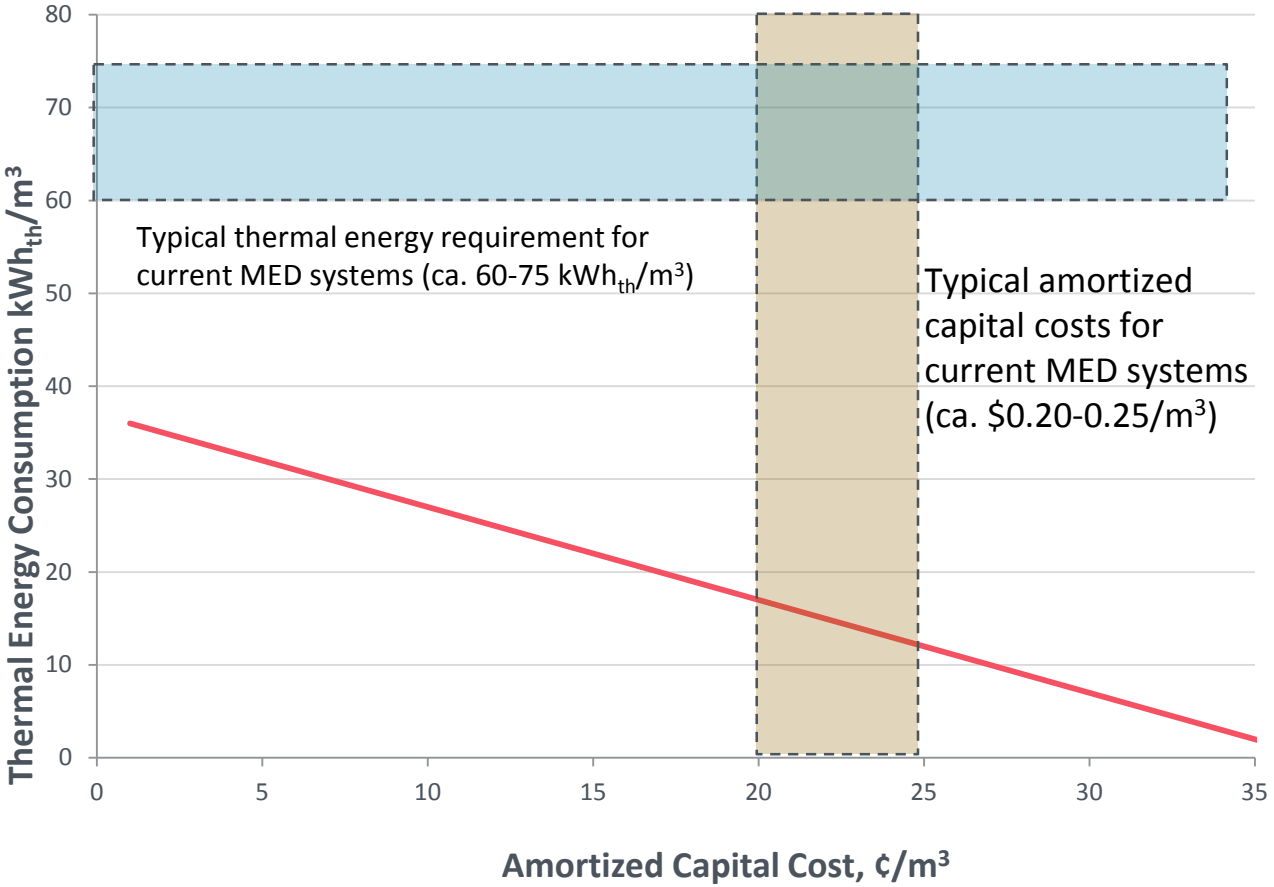
Innovations in thermal desalination technologies



Topic Area 1: Innovations in Desalination Technologies

- **Assume** LCOH of $ 0.01/kWh_{th} for large systems, and $0.015/$kWh_{th}$ for small systems
- Capital Cost and Energy Efficiency Reductions to attain LCOW ≤ 0.5 $/$m^3$ (large) and ≤ 1.5 $/$m^3$ (small)
- Two potential strategies:
  - dramatic improvements in established technologies and components that can lead to the achievement of the FOA cost targets proposed in Slide 5;
  - development low TRL novel thermal desalination techniques that, if further developed, can achieve the FOA targets.

Topic Area 1: Innovations in Desalination Technologies



- Justify how proposed innovations enable a thermal energy consumption and capital cost that fall **on or below the red line** (represents LCOW of $0.50/m^3)

Solar Desalination FOA Topic Areas

TOPIC AREA 2:

Low-cost solar thermal energy

Topic Area 2: Low Cost Thermal Energy

- $$\text{LCOH} = \frac{(\text{Installed } \mathbf{Cost}) * (\text{FCR}) + (\text{Annual O\&M})}{\text{Annual Thermal Generation (kWth)}}$$

- FCR is Fixed Charge Rate, and is defined as the product of project financing factor, construction financing factor, and capital recovery factor

- Topic Area 2 focuses on LCOH metric alone, and focuses on a ~50% reduction from current results

- Thermal energy storage solutions in the range of 120 – 180 °C may be necessary

Topic Area 2: Low Cost Thermal Energy

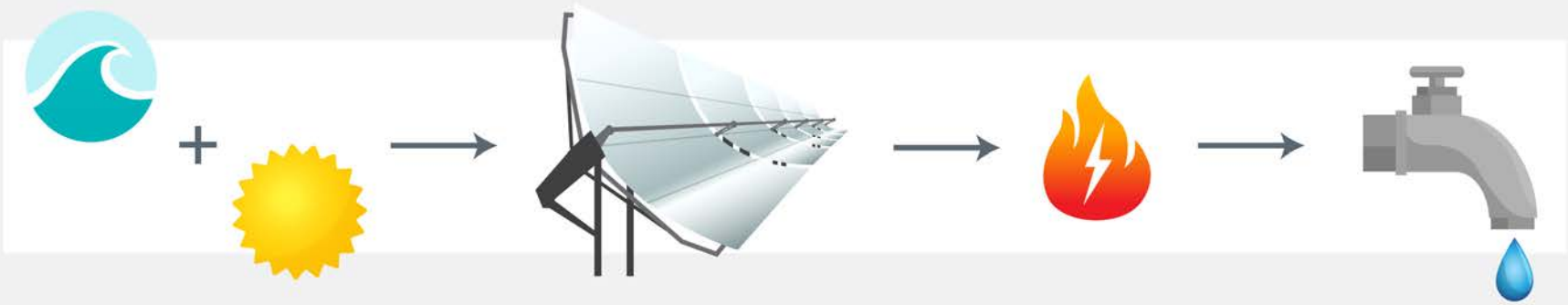
- LCOH Cost Target for Solar Field, 10 Hours of Storage

Component	Current (NREL 2015)	Large ($0.50/m^3)	Small ($1.50/m^3)
LCOH ($/kWh$_{thermal}$)	**0.027**	**0.01**	**0.015**
Total direct cost ($/m^2)	350	110	180
Site Prep ($/m^2)	30	20	10
HTF Receiver ($/m^2)	70	30	50
Collector ($/m^2)	170	45	100
O&M ($/m^2)	15	5	5
Storage ($/kWh$_{thermal}$)	20	10	10

Solar Desalination FOA Topic Areas

TOPIC AREA 3:

Integrated solar desalination systems



Topic Area 3: Integrated Solar Thermal Desalination system

- Applicants should justify that:
  - The target LCOW and thermal desalination Capital Cost/Energy Consumption described in the previous Topics can be achieved
  - The integrated system will be a relevant model for scale-up to a large scale system
  - The proposed LCOW, capital cost, LCOH targets are appropriate for a commercially operating system
- Applicants to this Topic Area should propose full system designs with solar as primary energy source
- Demonstration activities will be subject to 50% cost share
- Integration activities that are not full demonstrations but still target the energy efficiency of coupling solar thermal collection to thermal desalination will also be considered under this topic area

Solar Desalination FOA Topic Areas

TOPIC AREA 4:

Analysis for solar thermal desalination

Topic Area 4: Analysis for Solar Thermal Desalination system

- **Develop analytical tools that will simplify the planning, design, and valuation of solar thermal desalination**

- Potential applications of interest may include:
  - User-friendly software that identifies and models high-value opportunities where solar desalination may have the most impact
  - Integration of thermal desalination with advanced power cycles well-suited to concentrating solar power (e.g. supercritical-CO_2 power cycles)

Awards Overview

- Total federal funds available: $15,000,000
- Max award amount: $5,000,000
- Project period: 1 to 3 years
- Number of expected awards: 6-12
- Funding agreements in form of cooperative agreements
  - Funding mechanism with substantial involvement from DOE throughout the project
- Cost-share:
  - 20% for Topic Areas 1,2, and 4
  - 50% for demonstration activity in Topic Area 3
  - 20% for research and development activities in Topic Area 3

Cost-Share

Total Task Cost = Non-federal Share + Federal Share

$$\text{Cost Share} = \frac{\text{Non-federal Share}}{\text{Total Task Cost}} \times 100\%$$

Type of Task and Type of Recipient or Sub-recipient	Minimum cost-share	Requested Federal Funds (example)	Cost-share (min)	Total Budget for Task
R&D Task	20%	$1,000,000	$250.000	$1,250,000
Demonstration or Commercialization Task	50%	$300,000	$300,000	$600,000

Eligible Applicants (full details in FOA Section III.A)

- Individuals
  - U.S. citizens and lawful permanent residents
- Domestic entities
  - For- & not-for-profit, universities, national labs/FFRDCs
  - Can be held by foreign entity, but Applicant must be incorporated in U.S.
- Foreign entities
  - Waiver must be submitted for DOE approval
- Consortia
  - Can be a mix of domestic/foreign entities
  - Incorporated can apply as prime recipient
  - Unincorporated must designate a member as prime recipient

- **Applicants can submit more than one concept paper**
  - Each submission must be unique and distinct from the other(s)

Concept paper overview

- Provides early indicator of proposal relevance to FOA
  - Technical review criteria in FOA Section V.A.1
- For fairness, must conform to content requirements
  - Refer to FOA Section IV.C
- Encourage/Discourage notification sent to applicant
  - Notification will be sent approximately 3 weeks after concept paper due date
  - Applicants may submit a Full Application even if discouraged
- ***Concept papers are mandatory***
  - ***Only Applicants that submit a compliant Concept Paper are eligible to submit a Full Application.***

Concept Paper Content

- **Technology Description (3 pages max)**
  - The proposed technology, including 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;
  - 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.
  - Applicants may provide graphs, charts, or other data to supplement their Technology Description.
- **Team Description (2 pages max)**
  - What skills and expertise the Principal Investigator (PI) and Project Team have that will allow them to successfully execute the project plan;
  - Applicant's prior experience demonstrates an ability to perform tasks of similar risk and complexity;
  - Previous project and program collaborations between PI and team members; and
  - Equipment and facilities necessary to accomplish the effort to which applicant has access and/or how applicant intends to obtain access to the necessary equipment and facilities.

Key Points

- Follow the formatting criteria and page lengths stated in the FOA
- Triple check entries in Exchange
  - Submissions could be deemed non-compliant due to an incorrect entry and cannot be reviewed
- Make sure you hit the submit button
  - Any changes made after you hit submit will un-submit your application and you will need to hit the submit button again

Concept papers due December 4, 2017 at 5pm ET

Concept papers are mandatory

Submit Concept Paper in EERE-Exchange by

December 4, 2017 5:00 PM ET

https://eere-exchange.energy.gov/

Only applicants that have submitted a compliant Concept Paper are eligible to submit a Full Application

Concept Paper Review Criteria

- **Overall FOA Responsiveness and Viability of the Project**

  This criterion involves consideration of the following factors:

  - 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.

Concept Paper Review Process

- Applicants will be provided review comments on their Concept Paper as well as an Encourage/Discourage decision
- It is **expected** that Encourage/Discourage notifications will be released before January 1, 2018
- Full Applications will be due on March 16, 2018

Full Application Review Criteria

- **Criterion 1: Technical Merit and Innovation (50%)**
  - 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.
  - 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.

Full Application Review Criteria

- **Criterion 2: Project Research and Market Transformation Plan (30%)**
  - 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 Work plan and SOPO will succeed in meeting the project goals.
  - 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.
  - 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.
  - 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, and product distribution

Full Application Review Criteria

- **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 Work-plan; and
  - The reasonableness of the budget and spend plan for the proposed project and objectives.

Full Application Review Process

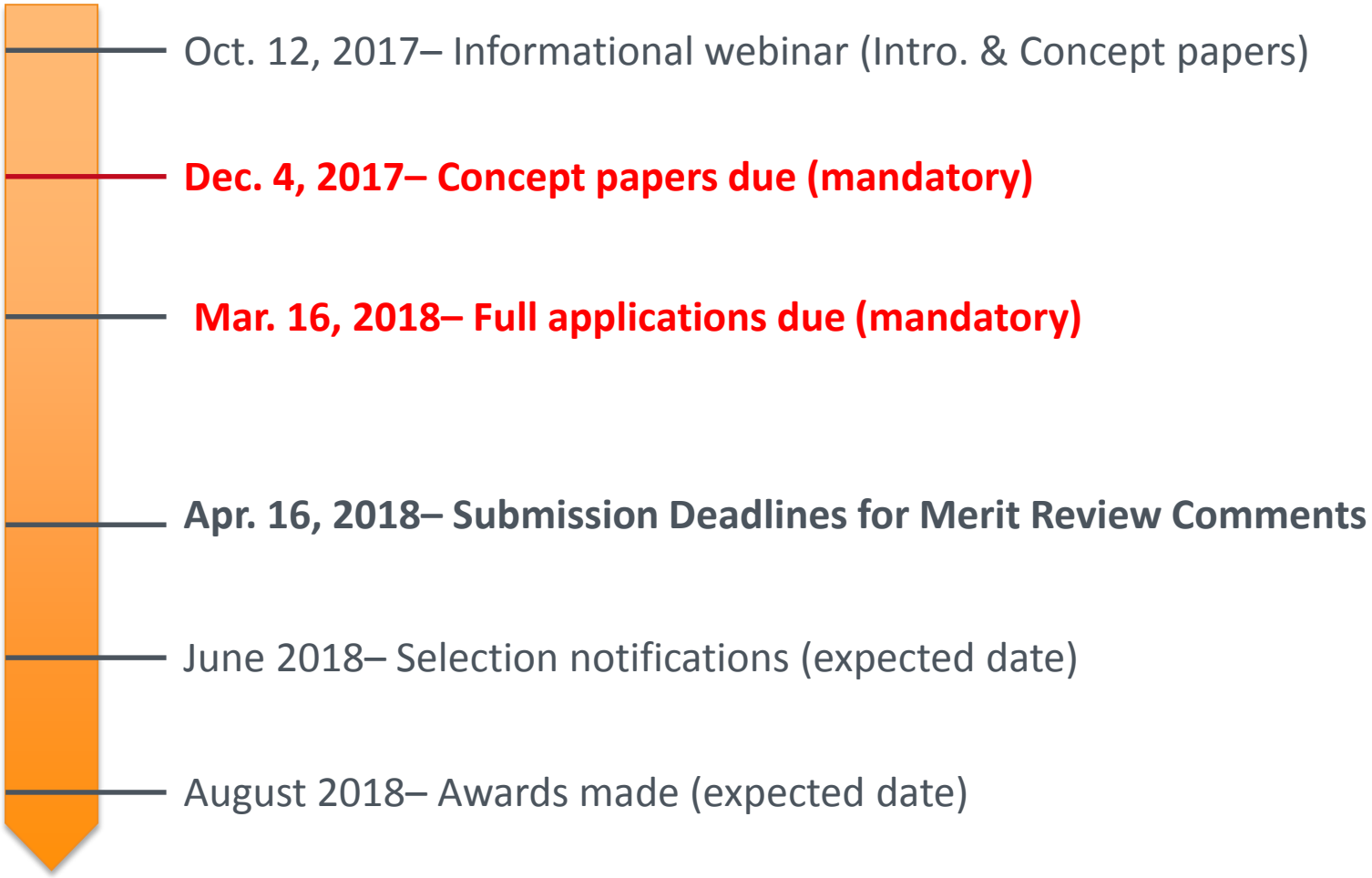
- Applicants will be provided review comments on their full applications
- Full Application Deadline

March 16, 2018 5:00 PM ET

https://eere-exchange.energy.gov/

- Applicants can respond to reviewer Comments April 16
- Selection Notification for **award negotiations** Expected in June 2018

Timeline


Oct. 12, 2017– Informational webinar (Intro. & Concept papers)
Dec. 4, 2017– Concept papers due (mandatory)
Mar. 16, 2018– Full applications due (mandatory)
Apr. 16, 2018– Submission Deadlines for Merit Review Comments
June 2018– Selection notifications (expected date)
August 2018– Awards made (expected date)

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Questions can be emailed to

SolarDesalFOA@ee.doe.gov

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