

Funding Opportunity Announcements

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Open Funding Opportunities

A funding opportunity announcement (FOA) is a document by which a U.S. Federal agency makes known its intentions to award discretionary grants or cooperative agreements, usually as a result of competition for funds. The following funding opportunities are still open for applications.

DOE Solar Energy Technologies Office American-Made Solar Prize [5.28.19]

Overview

The American-Made Solar Prize is a prize competition from the U.S. Department of Energy that is designed to revitalize U.S. solar manufacturing. The competition aims to support the growth of U.S. solar manufacturing and reenergize American energy innovation by tapping into American’s competitive spirit and the nation’s unparalleled innovation ecosystem.

Through a series of three contests, innovators from across the country work to transform big ideas into concepts and then prototypes ready for industry testing on a condensed timeline. The Solar Prize offers competitors \$3 million in cash prizes and support from the American-Made Network, helping connect entrepreneurs to national labs, industry experts, facilities, and other resources they need to succeed.

Through the American-Made Network, the world’s best-in-class national laboratory research base is combined with an unparalleled entrepreneurial support system consisting of pioneering fabrication facilities, energy incubators, and other valuable resources. Together, they support competitors in the Solar Prize to create a sweeping portfolio of innovations primed for private investment and commercial scale up.

Who Can Compete?

Competitors are entrepreneurial individuals or teams legally residing or based in the United States. Competitors can be individuals of one or multiple organizations, students, university faculty members, small business owners, researchers, or anyone with the desire and drive to transform an idea into an impactful solution.

The first round of the Solar Prize was announced in June 2018. Semifinalists were selected in February 2019 and finalists will be selected at a demonstration day event in June 2019. Round 1 winners will be announced in fall 2019.

The second round of the Solar Prize was announced in March 2019 and submissions are currently open. Read the rules and submit your idea by July 16.

Background

The Solar Prize supports the Administration's work to spur solar manufacturing, develop innovative solar solutions and products, and create domestic jobs and opportunities through public-private partnerships. The prize model disrupts traditional thinking, and introduces, expands, and evolves what's possible for federal agencies. Prize competitions increase the number of perspectives working to solve difficult problems, foster interdisciplinary collaboration, remove barriers to participation, and make innovation easy, fast, and agile.

The American-Made Solar Prize is the inaugural prize of the American-Made Challenges program, which incentivizes the nation's entrepreneurs to reassert American leadership in the energy marketplace. These new challenges seek to lower the barriers U.S.-based innovators face in reaching manufacturing scale by accelerating the cycles of learning from years to weeks, while helping to create partnerships that connect entrepreneurs to the private sector and the network of DOE's National Laboratories across the nation.

The American-Made Solar Prize is funded by the U.S. Department of Energy Solar Energy Technologies Office and is administered by the National Renewable Energy Laboratory.

For more information, please refer to the following links.

About the American-Made Solar Prize: <https://americanmadechallenges.org/solarprize/about.html>

How to Compete in the American-Made Solar Prize:
<https://americanmadechallenges.org/solarprize/compete.html>

American-Made Solar Prize: <https://americanmadechallenges.org/solarprize/index.html>

Network: <https://americanmadechallenges.org/solarprize/connect.html>

American-Made Solar Prize Official Rules Modification 01 09-17-2018 September 2018:
[American-Made Solar Prize Official Rules Modification 01 09-17-2018 September 2018.pdf](#)

American-Made Solar Prize Fact Sheet DOE NREL April 2018: [American-Made Solar Prize Fact Sheet DOE NREL April 2018.pdf](#)

FY19 Advanced Manufacturing Office Multi-Topic FOA; FOA # DE-FOA-0001980 [5.7.19]

FOA Issue Date:	5/7/2019
Submission Deadline for Concept Papers:	6/20/2019; 5:00pm ET
Submission Deadline for Full Applications:	8/29/2019; 5:00pm ET
Expected Submission Deadline for Replies to	10/16/2019; 5:00pm ET
Reviewer Comments:	

Expected Date for EERE Selection Notifications:	January 2020
Expected Timeframe for Award Negotiations:	March 2020

AMO supports innovative advanced manufacturing applied R&D projects that focus on specific high-impact manufacturing technology and process challenges. AMO invests in foundational energy-related advanced manufacturing processes (where energy costs are a determinant of competitive manufacturing) and broadly applicable platform technologies (the enabling base upon which other systems and applications can be developed). The competitively selected projects from this FOA will focus on developing next-generation manufacturing material, information, and process technologies that improve energy efficiency in energy intensive and energy dependent processes, and facilitate the transition of emerging cost-competitive energy technologies to domestic production.

AMO strategic goals supported by this FOA are to:

- Improve the productivity and energy efficiency of U.S. manufacturing.
- Reduce lifecycle energy and resource impacts of manufactured goods.
- Leverage diverse domestic energy resources in U.S. manufacturing, while strengthening environmental stewardship.
- Transition DOE supported innovative technologies and practices into U.S. manufacturing capabilities.
- Strengthen and advance the U.S. manufacturing workforce.

Multi-Topic FOA:

In fiscal year 2019, AMO is issuing a multi-topic FOA that integrates identified research opportunities across AMO into a single funding opportunity. With this FOA, the AMO intends to fund high-impact, early to mid-stage research in the following topic areas (More detailed descriptions of each topic area can be found in Section I.B. below):

Topic 1: Innovations for the Manufacture of Advanced Materials

- **Subtopic 1.1:** Accelerate the Manufacturing Process Design and Development Cycle for Advanced Energy Conversion and Storage Materials
- **Subtopic 1.2:** Innovative Manufacturing Processes for Battery Energy Storage
- **Subtopic 1.3:** Materials and Manufacturing Process Development of Nanocrystalline Metal Alloys
- **Subtopic 1.4:** Process-Informed Science, Design, and Engineering of Materials and Devices Operating in Harsh Service Conditions

Topic 2: Lower Thermal Budget (LTB) Processes for Industrial Efficiency & Productivity

- **Subtopic 2.1:** Advances in Industrial and Process Drying
- **Subtopic 2.2:** Thermal Process Intensification

Topic 3: Connected, Flexible and Efficient Manufacturing Facilities and Energy Systems

- **Subtopic 3.1:** Medium-Voltage Power Conditioning Systems to Enable Grid-Dispatchable and Resilient Manufacturing Facilities
- **Subtopic 3.2:** High Power to Heat Ratio, High Efficiency Combined Heat and Power (CHP)
- **Subtopic 3.3:** Verification and Validation of CHP and District Energy

Funding Levels:

The applicants' technologies may be at different levels of maturity; proposed funding levels and project durations should be commensurate with the workscope necessary to advance the technology to the proposed readiness level. Awards will be made at one of two funding levels:

- **Tier 1 - up to \$500,000 for up to 2 years** - concept definition and proof of concept projects are limited to Technology Readiness Level (TRL) 2 and TRL 3 activities.
- **Tier 2 - up to \$4,000,000 for up to 3 years (up to \$12,000,000 for Subtopic 1.2 and up to \$10,000,000 for Subtopic 2.2)** – Tier 2 projects can include activities in Tier 1, but must also include scope to bring the technology to later stage TRLs.

Funding requests must be justified, and should be commensurate with the scope of the work being proposed. More detail about estimated funding levels can be found in Section II.A.i.

Applications must clearly identify the starting and ending TRL for the project and justify the TRLs assigned. See Appendix E for EERE's definitions of TRLs.

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

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, or incomplete submissions.** EERE will not extend deadlines for applicants who fail to submit required information and documents due to server/connection congestion.

DOE Advanced Building Construction with Energy Efficient Technologies & Practices (ABC) [5.3.19]

FOA Issue Date:	5/3/2019
Informational Webinar :	5/13/2019 1:30 pm ET
https://doe.webex.com/doe/onstage/g.php?MTID=e0e763aac7daf6b2464e74ca4aebca3a3	
Submission Deadline for Concept Papers:	6/10/2019 5:00 pm ET
Submission Deadline for Full Applications:	8/12/2019 5:00 pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	9/17/2019 5:00 pm ET
Expected Date for EERE Selection Notifications:	In first quarter FY20
Expected Timeframe for Award Negotiations:	In first quarter FY20

DOE's mission is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. Powering and heating our homes, offices, schools, hospitals, restaurants, and stores consumes enormous amounts of energy. Residential and commercial buildings account for approximately 40% of the nation's total energy demand—greater than that for either industry or transportation—about 75% of all electricity use, and even more of peak power demand, resulting in an annual national energy bill totaling more than \$380 billion. There is tremendous opportunity for savings given that 55% of the nation's more than 118 million homes and 50% of the nation's 5.6 million commercial buildings were built before 1980—prior to the existence of today's more efficient products and building construction practices.

Unlocking the potential energy savings of these buildings through more affordable energy efficiency technologies represents significant economic opportunities for the United States. Implementation of more affordable efficiency technologies would yield such corollary benefits as alleviating stress on the electric grid and improving its reliability, resilience, and environmental performance. For American households and businesses, improving the energy efficiency of buildings translates to lower energy bills in homes and commercial buildings. Cutting energy waste in U.S. buildings by 20% would save our nation some \$80 billion annually on energy bills, about \$235 a year for each person in the United States. Furthermore, saving money on energy costs allows more money to flow into other sectors of the economy, leading to the creation of new jobs.

Remaining Challenges and Opportunities

The United States has made significant progress in improving building energy efficiency over the last 30 to 40 years⁴ due in part to the breakthrough research supported by BTO.⁵ BTO has improved the affordability and performance of a wide range of new energy technologies, including many advances in solid-state lighting, highly efficient windows, heat pump water heaters, and high efficiency furnaces and air conditioners, among other areas. These technologies have in turn enabled major advancements in energy efficiency for both new and existing buildings.

Nevertheless, energy use in U.S. residential and commercial buildings remains the largest end-use sector, and Americans spend a significant portion of income powering the buildings in which they live and work. Still, demand for energy efficiency in buildings—beyond simple equipment upgrades like light-emitting diode (LED) lights—remains low for a number of reasons, including the following challenges:

- Whole building efficiency (new or retrofits) cannot be implemented by deploying a single product or action.
- Whole building energy efficiency retrofits are typically more expensive than single technology upgrades.

- The benefits of whole building energy efficiency retrofits are often spread among more than one beneficiary.
- The value proposition for whole building efficiency and/or retrofits is not always clear to the parties that need to take action.
- Available building efficiency products and processes can be disruptive which, understandably, often leads to a reluctance to adopt them.

This FOA represents an integrated strategy across BTO activities to capitalize on this opportunity and develop innovative and advanced technologies that can maximize energy efficiency while being economical, practicable, and appealing; leverage opportunities for buildings to be more responsive to the grid; and encourage productive partnerships that can help overcome technical and other challenges.

Specifically, the FOA will fund research aimed at developing transformative technology solutions that—

- deliver cost-effective and scalable¹⁵ deep energy savings in both new and existing buildings;
- incorporate methods to modernize construction, reduce costs, and improve quality;
- address aforementioned barriers to rapid and broad-scale adoption of energy efficiency technologies and approaches; and,
- where possible, serve complementary interests such as grid reliability, productivity, comfort, etc. to help drive uptake.

FY20 Single-Year Lab Projects in Photovoltaics (PV) and Concentrating Solar-thermal Power (CSP) [3.28.19]

Key Dates	
Solicitation Issue Date	March 28, 2019
Submission Deadline for Proposals	May 22, 2019 7PM Eastern Time
Selection Date	Mid-July
Full Solicitation	See Attachment
Summary Information	
NETL Eligibility	<p>NETL is eligible to submit proposals as a prime awardee.</p> <ul style="list-style-type: none"> • Proposals that involve more than one laboratory are also allowed. • Applications led by women, minority or underrepresented researcher categories are especially encouraged.

	<ul style="list-style-type: none"> • There is no restriction on the number of applications submitted by the lab. • One-year Lab Call projects selected in FY 2019 are allowed to submit follow-up proposals.
<p>Cost Share/Matching Requirement</p>	<p>Cost sharing is not required.</p> <p>Collaborations among varied internal or inter-lab disciplines and/or partnerships with external entities are encouraged in order to foster transfer of developed technologies and analyses to commercial implementation and to increase the impact of the funded activity.</p>
<p>Scope of Solicitation/ Topic Areas</p>	<p>Single-year FY20 Annual Operating Plan (AOP) national lab projects that advance high-risk, novel research in photovoltaics (PV) and concentrating solar-thermal power (CSP).</p> <p>PHOTOVOLTAICS (PV)</p> <p>Single-Year Projects on Breakthrough PV Cell and Module Concepts</p> <p>This topic will support high-risk, breakthrough ideas that, if successful, would create disruptive PV cell and/or module technology and enable major leveled cost of energy (LCOE) reductions toward the SunShot 2030 targets. High-risk, potentially breakthrough ideas, such as tandem cells, contact and interconnect innovations, are encouraged in this topic.</p> <p>CONCENTRATING SOLAR-THERMAL POWER (CSP)</p> <p>Single-Year Projects Developing Novel CSP Concepts</p> <p>This topic will support efforts to test and advance novel CSP-relevant ideas or components that may have a disruptive impact on future CSP LCOE or value. Areas of interest include all CSP technologies that may be compatible with SunShot 2030 cost targets. Many relevant goals are described in SETO’s most recent Portfolio Review Report (see pages 20-25).</p> <p>Please read the full LAB Call for additional information about each topic area.</p>
<p>Award Size/Expected Number of Awards</p>	<p>PHOTOVOLTAICS (PV): Awards will be made to an individual or small group for initial work that, if successful, would de-risk an idea. PV topic awards are for up to \$200,000 for one-year. The office expects to select between three and six FY20 PV awards.</p> <p>CONCENTRATING SOLAR-THERMAL POWER (CSP): Project award sizes will be considered for up to \$1,000,000 with an expected median award size of around \$200,000. Applicants requesting greater than</p>

	\$400,000 in federal funds may submit an application up to six pages in length. Beyond this exemption, all applications should comply with the submission requirement below.
Other Information	<p>Please refer to the Lab Call Section 5.C (pages 28-31) for the description of the concept paper format to be used for FY20 single-year project submissions.</p> <p>DOE strongly encourages all applicants submit the required information at least 24 hours in advance of the submission deadline. Applicants should not wait until the last minute—internet and data server traffic can be heavy in the last hours before the submission deadline, which may affect the applicants ability to successfully submit the required information before the deadline.</p>

DOE Solar Energy Technologies Office Fiscal Year 2019 Funding Program; FOA # DE-FOA-0002064 [3.26.19]

Issuing Organization: U.S. Department of Energy’s (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Solar Energy Technologies Office (SETO)

FOA Issue Date:	March 26, 2019
Submission Deadline for Mandatory Letter of Intent (LOI):	May 7, 2019, 5:00 pm ET
Informational Webinars:	Five webinars will be scheduled (one per topic area). Webinar information will be available in EERE Exchange at https://eere-Exchange.energy.gov .
Submission Deadline for Concept Papers: <ul style="list-style-type: none"> • Applicants must submit a Concept Paper by 5:00pm ET on the due date listed to be eligible to submit a Full Application. • Topic Area 1.2 applicants must resubmit their LOI again as a Concept Paper by the Concept Paper deadline listed to clear an administrative software restriction of EERE Exchange. 	May 14, 2019, 5:00 pm ET
Submission Deadline for Full Applications and SIPS Applications:	July 25, 2019, 5:00 pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	September 6, 2019, 5:00 pm ET
Expected Date for EERE Selection Notifications:	November 2019
Expected Timeframe for Award Negotiations:	November 2019-February 2020

- Applicants must submit a Letter of Intent (LOI) and Concept Paper by 5:00 pm ET on the due date listed above to be eligible to submit a Full Application.
- To apply to this Funding Opportunity Announcement (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/selection be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancellation of further award negotiations and rescission of the selection.

DOE Collaboration Opportunities

The Department of Energy (DOE) seeks qualified industry partners to participate in short-term collaborative projects with the DOE's national laboratories.

HPC4EnergyInnovation Program: Collaborations for U.S. Manufacturers [4.5.19]

The High Performance Computing for Energy Innovation (HPC4EI) Program seeks qualified industry partners to participate in short-term, collaborative projects with the Department of Energy's (DOE's) national laboratories. Through support from the Office of Energy Efficiency and Renewable Energy's (EERE) Advanced Manufacturing Office (AMO), Fuel Cell Technologies (FCTO), and Vehicle Technologies Offices (VTO) and DOE's Office of Fossil Energy (FE), the selected industry partners will be granted access to high performance computing (HPC) facilities and world-class scientists at DOE's national laboratories. HPC4EI is the umbrella program for the HPC4Manufacturing (HPC4Mfg), HPC4Materials (HPC4Mtls), and HPC4Mobility programs.

- The HPC4Mfg Program is interested in establishing collaborations that address key manufacturing challenges by applying modeling, simulation, and data analysis. The program aims to improve energy efficiency, increase productivity, reduce cycle time, enable next-generation technologies, test control system algorithms, investigate intensified processes, lower energy cost, and accelerate innovation.
- The HPC4Mtls Program is interested in collaborations that address key challenges in developing, modifying, and/or qualifying new or modified materials that perform well in severe or complex environments through the application of HPC, modeling, simulation, and data analysis.
- The HPC4Mobility Program is interested in collaborations that address key mobility challenges in developing, modifying, and/or qualifying new or modified software, hardware, and implementation solutions that perform well in complex mobility systems and systems of systems in rural and metropolitan areas on local, regional, state, or national level through the application of HPC, modeling, simulation and data analysis.

Outlined below in the Background Section are topics of interest specific to the offices supporting this solicitation.

Eligibility for the HPC4Mfg and HPC4Mtls programs is limited to entities that manufacture or develop products in the United States for commercial applications and the organizations that support them. Relevant government entities are eligible to receive awards from the HPC4Mobility Program only. Selected demonstration projects will be awarded up to \$300,000 to support compute cycles and work performed by the national lab partners. The industry partner must provide a participant contribution of at least 20% of the DOE funding for the project.

In addition, we will consider follow-on projects to previously awarded, successful demonstration projects in these areas. These projects should focus on the further implementation of the demonstrated HPC application in the industrial setting - taking it closer to operational use and broad national impact. Selected follow-on projects will be awarded up to \$300,000 to support computing cycles and work performed by the national lab partners. The industry partner must provide a participant contribution of at least 50% of the DOE funding for the project; of this, at least half should be in cash to support the national laboratory work.

Timeline Event	Date (2019)
Call for Proposal	April 1, 2019
Concept paper due	May 6, 2019
Request for full proposal	End of June 2019
Full proposal due	End of July 2019
Finalists notified	October 2019
Expected project start	November 2019

Request for Application (RFA)

A request for application (RFA) is a type of solicitation notice in which an organization announces that grant funding is available. An RFA informs researchers and other organizations that they may present bids on how the funding could be used.

There are currently no active RFAs.

Request for Proposal (RFP)

A request for proposal (RFP) is a document that solicits proposal, often made through a bidding process, by an agency or company interested in procurement of a commodity, service, or valuable asset, to potential suppliers to submit business proposals.

There are currently no active RFPs.

Notice of Intent (NOI)

Notices of Intent are issued so that interested parties are aware of the intention of a Federal agency to issue a Funding Opportunity Announcement (FOA) in the near term. All information contained in the notice is subject to change.

Regional Initiative to Accelerate Carbon Capture, Utilization, and Storage (CCUS) Deployment; FOA # DE-FOA-0002086 [2.11.19]

The Department of Energy (DOE) National Energy Technology Laboratory (NETL) intends to issue a Funding Opportunity Announcement (FOA) on behalf of the Office of Fossil Energy (FE), Carbon Storage Program. The FOA is anticipated to be issued in the second quarter of Fiscal Year 2019. The FOA will competitively award cooperative agreements that identify and address regional challenges to accelerate commercial deployment of carbon capture, utilization, and storage (CCUS) through a new regional initiative. DOE envisions awarding up to 4 financial assistance awards that will last 3-5 years.

This regional initiative may be based upon an established Regional Partnership region or a newly proposed region. The FOA will be an open solicitation that encourages consolidation of expertise and stakeholders within current Regional Carbon Sequestration Partnerships (RCSPs) to define regions that include expertise and stakeholders to accelerate commercial deployment of carbon storage.

The FOA will seek to preserve, share, and advance the existing research and development (R&D) through activities to include:

1. Addressing Key Technical Challenges - Facilitate regional deployment of integrated CCUS by advancing the critical knowledge and capabilities needed for successful storage operations towards commercial deployment beginning in 2025 that ensures safe, secure, efficient, and affordable Carbon Dioxide (CO₂) injection and containment in potential regional storage complexes in diverse geologic settings.
2. Facilitating Data Collection, Sharing, and Analysis - Collaborate with other DOE FE funded research efforts, including academia, National Laboratories and industry, to coordinate and facilitate collection and analysis of new data, and analysis of existing data in the region to improve understanding of the impacts of CO₂ injection/storage and ensure safe, secure, efficient, and affordable CO₂ injection and containment.
3. Evaluating Regional Infrastructure - Evaluate the regional needs and challenges for the development of a safe and environmentally sound CO₂ infrastructure that would transport CO₂

captured from fossil power generating plants and/or industrial sources and distribute for associated storage in enhanced oil recovery (EOR), saline storage, and/or other suitable storage sites.

4. Promoting Regional Technology Transfer – Identify and engage industry, utilities, potential site operators, regional non-governmental organizations, local authorities, and regulators to inform and educate on CCUS technologies.

ELIGIBILITY

All types of entities will be eligible to apply except Federal agencies, Federally Funded Research and Development Centers (FFRDC), and nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995. Although FFRDC contractors are not eligible for an award as a prime, they may be proposed as a team member if, in aggregate, their effort does not exceed 30% of the total estimated cost of the project, including the applicant's and the FFRDC contractor's portions of the effort. The National Energy Technology Laboratory may not participate as a project team member or sub-awardee.

Previous Funding Opportunities

A funding opportunity announcement (FOA) is a document by which a U.S. Federal agency makes known its intentions to award discretionary grants or cooperative agreements, usually as a result of competition for funds. The following funding opportunities are no longer accepting applications.

Appalachian Regional Commission (ARC) Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative Grants [3.5.19]

RFP release date: January 7, 2019

Proposal due date: April 10, 2019 at 5:00 PM (EDT)

The Appalachian Regional Commission (ARC) is publishing this Request for Proposals (RFP) to solicit applications for grants under the Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative for Federal Fiscal Year 2019 (FY19) funding. The POWER Initiative is a congressionally funded initiative that targets federal resources to help communities and regions that have been affected by job losses in coal mining, coal power plant operations, and coal-related supply chain industries due to the changing economics of America's energy production. POWER supports efforts to create a more vibrant economic future for coal-impacted communities by cultivating economic diversity, enhancing job training and re-employment opportunities, creating jobs in existing or new industries, and attracting new sources of investment. This RFP is organized to provide a general overview of the POWER Initiative, as well as the specific requirements needed to complete a POWER FY19 grant application.

Additional background information on the POWER Initiative and a complete list of projects that have been funded under this effort is available at: <https://www.arc.gov/funding/POWER.asp>.

POWER (Partnerships for Opportunity and Workforce and Economic Revitalization) is a congressionally funded initiative that targets federal resources to help communities and regions that have been affected by job losses in coal mining, coal power plant operations, and coal-related supply chain industries due to the changing economics of America's energy production.

In Fiscal Year 2019, ARC's POWER Initiative will continue focusing on investments that are regional, strategic, transformational, and maximize economic revitalization in Appalachia's coal-impacted communities. POWER investment priorities include:

- Building a competitive workforce;
- Enhancing access to and use of broadband services;
- Fostering entrepreneurial activities; and
- Developing industry clusters in communities; and
- Strengthening substance abuse response.

Eligible funding applicants include:

- Local development districts;
- Indian Tribes or a consortium of Indian Tribes;
- States, counties, cities, or other political subdivision of a state, including a special purpose unit of a state or local government engaged in economic or infrastructure development activities, or a consortium of political subdivisions;
- Institutions of higher education or a consortium of institutions of higher education; and
- Public or private nonprofit organizations or associations.

DOT Automated Driving System Demonstration Grants; NOFO # 693JJ319NF00001 [12.21.18]

The U.S. Department of Transportation (USDOT) has announced that up to \$60 million in grant funding is available for automated driving system/autonomous vehicle demonstration projects.

The USDOT Notice of Funding Opportunity (NOFO) will result in multiple grant awards to eligible entities to fund demonstration projects that test the safe integration of automated driving systems into the Nation's on-road transportation system.

Full applications are due on March 21, 2019, and must be submitted through www.Grants.gov

The goals of the Automated Driving System (ADS) Demonstration Program are:

a. Safety: Test the safe integration of ADS into the Nation's on-road transportation system. Fund projects that demonstrate how challenges to the safe integration of ADS into the Nation's on-road transportation system can be addressed.

b. Data for Safety Analysis and Rulemaking: Ensure significant data gathering and sharing of project data with USDOT and the public throughout the project in near real time, either by streaming or periodic batch updates, and demonstrate significant commitment to leveraging the demonstration data and results in innovative ways. Fund demonstrations that provide data and information to identify risks, opportunities, and

insights relevant for USDOT safety and rulemaking priorities needed to remove governmental barriers to the safe integration of ADS technologies.

For example:

- What safety metrics characterize safety risk of ADS integration into the transportation system?
- What data are necessary to develop these metrics?
- How can the demonstration help provide data to set a baseline for human safety?
- How can the demonstration help provide data to set a baseline for the safety of ADS operation?
- How can operational data provide leading indicators that would enhance future safety analysis?
- How can the demonstration help provide data to define safety equivalency for ADS light duty and heavy-duty vehicles, including commercial motor vehicles?

c. Collaboration: This program seeks to work with innovative State and local governments, as well as universities and private partners, to create collaborative environments that harness the collective expertise, ingenuity, and knowledge of multiple stakeholders. These projects should include early and consistent stakeholder engagement, including early coordination with law enforcement, local public agencies, industry, transportation-challenged populations, the public, and other relevant stakeholders as applicable to conduct these demonstrations on terms that work for all parties.

In addition to the program goals listed above, the focus areas of the ADS Demonstration Program are:

a. Significant Public Benefit(s): Fund a select number of larger-scale projects that result in a significant benefit(s) to the public.

b. Addressing Market Failure and Other Compelling Public Needs: Fund projects where industry lacks adequate incentives to participate. This includes areas where cost, risk, or complexity are too significant for any single private sector entity (e.g., cybersecurity) or where a lack of private sector investment has not proven sufficient to support particular groups (e.g., access for individuals with disabilities).

c. Economic Vitality: Ensure that these Federal funds support the U.S. industrial base through Buy American and other requirements. Recognizing Executive Order 13788, proposed projects must support economic vitality at the national and regional level, including advancing domestic industry and promoting domestic development of intellectual property.

d. Complexity of Technology: Fund a collection of projects that demonstrate automation, with preference for demonstrating L3 or greater automation technologies.

e. Diversity of Projects: Fund a collection of projects that serve a variety of communities, including urban, suburban, and rural environments, and that serve a variety of transportation markets including freight, personal mobility, and public transportation.

f. Transportation-challenged Populations: Fund projects that test applications with the greatest potential to service transportation-challenged populations, including older adults and individuals with disabilities. As applicable for such populations, projects may focus on entry, egress, and options to make transfer easy, which may include design of ADS for

accessibility, usability, and safety, including securement and restraint systems for wheelchairs and other equipment for people with disabilities.

g. Prototypes: Given the focus on demonstrations, fund projects that include technologies that are, at a minimum, in limited prototype state suitable to support safe demonstrations but do not need to be ready for broader deployment. Demonstrations must meet all applicable safety standards or have a detailed approach concerning how the grantee intends to apply for any necessary exemptions.

Eligible Applicants include:

- State and Local governments
- Tribal governments
- Transit agencies and authorities
- Metropolitan planning organizations
- Other subdivisions of State or local governments (including public port authorities/districts)
- Public academic institutions
- Public research institutions, or
- A multijurisdictional group thereof applying through a single lead applicant

Cost sharing or matching is NOT required but is encouraged and will be considered in the award selection process.

Energy-Water Desalination Hub; FOA # DE-FOA-0001905 [12.12.18]

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

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

Successful Applicants will address key technical focus areas in Energy-Water Desalination and will operate as a coordinated R&D hub of experts across industry, university, and national laboratories, as well as other key stakeholders. The Hub will pursue a cohesive, strategic R&D

investment portfolio with the highest impact for energy efficiency, water efficiency, and cost reductions to enable achievement of pipe parity of desalination from a range of water sources. Pipe parity will be defined using technical, cost, and environmental success metrics such as: energy intensity (energy/m³ water); levelized cost of water (\$/m³ water) including assumptions about discount rate, plant life, etc.; life cycle energy; water intensity (m³/unit of end product); degree of utilization of unconventional water or energy sources, or exploiting synergies between energy systems; environmental considerations; and water system security and resiliency (e.g., risk of disruption, # of days of lost service).

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

DOE has organized the Hub into four topic areas:

1) Materials Research and Development - Materials R&D has the potential to improve materials used in specific components and in water treatment systems to improve energy efficiency and lower costs. Desalination and related water treatment technologies can benefit from materials improvements for a range of products, including membranes, pipes, tanks and pumps that dramatically increase their performance, efficiency, longevity and are durable and corrosion resistant.

2) New Process Research and Development - Novel technology processes and system design concepts are needed to improve energy efficiency and lower costs for water treatment, including new technologies related to water pre-treatment systems (e.g., upstream from the desalination unit operation). New process technologies are also needed to address associated challenges such as water reuse, water efficiency, and high-value co-products.

3) Modeling and Simulation Tools - Multi-scale models and simulation tools are needed to inform the R&D via performance forecasting, design optimization, and operation of desalination technologies and related water-treatment systems that will lead to improved energy efficiency and lower cost.

4) Integrated Data and Analysis - In order to consistently define, track, and achieve pipe parity in the highest impact areas, central, strategic, non-biased, integrated data and analysis is needed to align the Hub's project-level activities in each of the four topic areas to the Hub goals and to measure technical success of both project-level activities and the overall Hub. There is also a need to develop information resources, studies, and analysis tools necessary to guide the Hub's strategic R&D portfolio.

The intent of this approach is to assemble the most highly qualified experts across the breadth and scope of the Hub’s four topic areas. An ideal Hub application would include multi-disciplinary experts from across industry, manufacturers, university, non-profits, Federally Funded Research and Development Centers (FFRDC), states and municipalities, as well as other key stakeholders with expertise in advanced energy technology applicable to the Energy-Water Desalination Hub.

EPA Clean Diesel Funding Assistance Program FY 2019; RFA # EPA-OAR-OTAQ-19-01 [12.20.18]

The U.S. Environmental Protection Agency (EPA) anticipates awarding approximately \$40 million in competitive grant funding for the Diesel Emissions Reductions Act (DERA) Clean Diesel Funding Assistance Program. The Program is soliciting applications nationwide for projects that achieve significant reductions in diesel emissions in terms of tons of pollution produced and exposure, particularly from fleets operating in areas designated by the EPA Administrator as poor air quality areas.

Application packages must be submitted electronically to EPA through Grants.gov (www.grants.gov) no later than Wednesday, March 6, 2019, at 11:59 Eastern time to be considered for funding.

Note the attached file and the information detailed below. For more information, also visit: <https://www.epa.gov/cleandiesel/clean-diesel-national-grants>

Important Dates

Activity	Date
Request for Applications (RFA) Opens	Thursday, December 20, 2018
Information Session Webinar Link to Webinar Call-in Number: 1-202-991-0477 Access Code: 414-9804#	Tuesday, January 8, 2019 at 3 p.m. ET
Information Session Webinar Link to Webinar Call-in Number: 1-202-991-0477 Access Code: 414-9804#	Wednesday, January 9, 2019 at 2 p.m. ET
Frequently Asked Questions Document (FAQ) Deadline for Submittal of Questions	February 22, 2019 at 4 p.m. ET
Deadline for Applications	Tuesday, March 26, 2019, at 11:59 p.m. (ET)
Notification of Selected Applicants	April 2019
Funding of Awards	May – October 2019

Supporting Information for RFA

[2019 Sample Project Narrative \(WORD\)](#)(15 pp, 674 K, December 2018)

[2019 Sample Application Fleet Description \(Excel\)](#)(712 K, December 2018)

[2019 Priority Area List \(PDF\)](#)(13 pp, 1 M, December 2018)

[2019 Sample Drayage Operating Guidelines \(PDF\)](#) (2 pp, 161 K, December 2018)

[Clean Diesel Funding Assistance Program FY 2019 Transport Refrigeration Unit \(TRU\) Factsheet](#) (3 pp, 76 K, December 2018, EPA-420-F-18-028)

Frequently Asked Questions

All applicants are encouraged to review the [Frequently Asked Questions \(FAQ\) \(PDF\)](#) (13 pp, 357K, December 19, 2018) for further clarification of this Request for Applications. Applicants may email written questions to: cleandiesel@epa.gov. Please type “RFA Question” in the subject line. The FAQ document will be updated weekly during the application period, and the estimated final posting of the FAQ document will be Wednesday, February 27, 2019.

See the deadline for submitting questions for the FAQ document in the Important Dates section above. All questions and answers, including those from all webinar information sessions, will be added to this document.

Eligible Applicants

The following U.S. entities are eligible to apply for Clean Diesel National Grants:

Regional, state, local or tribal agencies/consortia or port authorities with jurisdiction over transportation or air quality

Nonprofit organizations or institutions that represent or provide pollution reduction or educational services to persons or organizations that own or operate diesel fleets or have the promotion of transportation or air quality as their principal purpose.

School districts, municipalities, metropolitan planning organizations (MPOs), cities and counties are all eligible entities to the extent that they fall within the definition above.

Please refer to the [full RFA for specific information about this competition](#).

Eligible Uses of Funding

Eligible diesel vehicles, engines and equipment include:

School buses

Class 5 – Class 8 heavy-duty highway vehicles

Locomotive engines

Marine engines

Nonroad engines, equipment or vehicles used in construction, handling of cargo (including at ports or airports), agriculture, mining or energy production (including stationary generators and pumps).

Grant funds may be used for clean diesel projects including:

[EPA verified](#) technologies or certified engine configurations

[California Air Resources Board \(CARB\)](#) EXIT verified technologies or certified engines

[Idle-reduction technologies](#) that are EPA verified

[Aerodynamic technologies](#) and [low rolling resistance tires](#) that are EPA verified

Early engine, vehicle, or equipment replacements with [certified engine configurations](#)

Funds awarded under this program cannot be used to fund emission reductions mandated by federal law. Equipment for testing emissions or fueling infrastructure is not eligible for funding. Please refer to the [full RFA for specific information about this competition](#).

Grant Process

The RFP includes information on how to prepare and submit a proposal package. The proposal package must be received by the deadline and include the following documents:

Project Narrative (no more than 11 pages)

Standard Form SF 424 – Application for Federal Assistance

Standard Form SF 424A – Budget Information

Standard Form 424B - Non-Construction Programs

EPA Form 4700-4 - Pre-Award Compliance Review

EPA Form 5700-54 - Key Contacts Form

Applicant Fleet Description information (not included in the page limit)

Emissions Reduction Calculations (not included in the page limit)

Cost-Share Commitment Letters, if applicable (not included in the page limit)

Partnership Letters, if applicable (not included in the page limit)

Mandated Measures Justification Supporting Information, if applicable (not included in the page limit)

After the closing date, all eligible applications will be reviewed and ranked. Selected projects may be fully or partially funded.

Tools and Resources for Applicants

Tips for a Successful Diesel Retrofit Project (PDF) (7 pp, 500 K, April 2013, EPA-420-B-13-025) provides tips to help you get started and avoid common mistakes.

Technology Tips: Diesel Emissions Reduction Program (DERA): Technologies, Fleets and Projects Information (PDF) (36 pp, 1.3MB, October 2011, EPA-420-P-11-001) provides information about retrofit technologies and what to look for.

Clean Diesel Clearinghouse (CDCH) EXIT is a web-based tool that helps users determine the best available emission reduction technology for retrofitting diesel-powered vehicles and equipment.

Shore Power Technology Assessment at U.S. Ports

ARPA-E Solicitation on Topics Informing New Program Areas; FOA # DE-FOA-0001953 [12.20.18]

U.S. Department of Energy’s (DOE’s) Advanced Research Projects Agency-Energy (ARPA-E) announced its latest funding opportunity designed to support early stage, transformative energy technologies. The “Solicitation on Topics Informing New Program Areas” funding opportunity enables ARPA-E to investigate potential new program areas while highlighting energy challenges of critical interest to American competitiveness and security.

“By design, ARPA-E is an agency that adapts quickly to the changing energy landscape, and this new program will allow us to better capitalize on emerging energy trends,” said U.S. Secretary of Energy Rick Perry. “This program will enable the Department to target technologies at the project level, driving innovation and creating new opportunities.”

This Funding Opportunity will remain open for an extended period, and new topics will be released periodically to target emerging technologies and potential new program areas. This first round calls for innovative technologies supporting next generation nuclear energy, high temperature sensors for downhole geothermal exploration, and ultra-durable, lower-energy concrete for infrastructure. ARPA-E will award up to \$18 million to project teams spread across standard and small business (SBIR/STTR) solicitations.

DOE believes these funded projects could encourage the development of cross-disciplinary communities around these topic areas, potentially leading to the creation of new projects and programs.

For more information, visit: <https://arpa-e-foa.energy.gov/>

Appendix	Targeted Topic Title	Issue Date	Deadline for Questions to ARPA-E CO	Full Application Submission Deadline	Total Amount to be Awarded (subject to the availability of funds)	Anticipated Awards	Max Period of Performance	Expected Date for Notifications
A	Extremely Durable Concretes and Cementitious Materials	12/20/2018	5 PM ET, 2/8/2019	9:30 AM ET, 2/18/2019	Approximately \$8M total	5 – 8 awards	24 months	May 2019

B	Leveraging Innovations Supporting Nuclear Energy	12/20/2018	5 PM ET, 2/8/2019	9:30 AM ET, 2/18/2019	Approximately \$8M total	3 – 5 awards	24 months	May 2019
C	Downhole Tools to Enable Enhanced Geothermal Systems	12/20/18	5 PM ET, 2/8/2019	9:30 AM ET, 2/18/2019	Approximately \$2M total	2 – 4 awards	24 months	May 2019

This announcement is purposely broad in scope, and will cover a wide range of topics to encourage the submission of the most innovative and unconventional ideas in energy technology. The objective of this solicitation is to support high-risk R&D leading to the development of potentially disruptive new technologies across the full spectrum of energy applications. Topics under this FOA will explore new areas of technology development that, if successful, could establish new program areas for ARPA-E, or complement the current portfolio of ARPA-E programs.

Targeted Topics:

A. Extremely Durable Concretes and Cementitious Materials

Full Application Submission Deadline: 9:30 AM ET, February 18, 2019

ARPA-E is interested in receiving Full Applications in support of advancing extremely durable concretes and cementitious materials. This topic seeks research towards concrete that outlasts conventional concrete, reduces lifetime O&M expenses and their associated energy requirements, and therefore greatly reduces cement/concrete. Work under this program will consist of early stage research.

B. Leveraging Innovations Supporting Nuclear Energy

Full Application Submission Deadline: 9:30 AM ET, February 18, 2019

It is clear that a substantial reduction of construction cost, O&M cost, and construction time, in combination with targeting reactor plant operation for commercial viability, is required to fundamentally enhance the competitiveness and attractiveness of nuclear energy. The ARPA-E MEITNER Program (DE-FOA-0001798)[1] is already investigating several innovative

technologies that forward this goal. The purpose of this Targeted Topic is to address key technology gaps in the portfolio.

<https://arpa-e.energy.gov/?q=arpa-e-programs/MEITNER>

C. Downhole Tools to Enable Enhanced Geothermal Systems

Full Application Submission Deadline: 9:30 AM ET, February 18, 2019

ARPA-E seeks novel low-cost sensor technologies capable of mitigating risks and lowering costs in EGS development by better characterizing rock formations and fluid enthalpy at depth. Technologies of interest include but are not limited to fiber-optic sensors and enthalpy measurement devices, as well as companion electronics and communications equipment. Successful projects will facilitate reservoir creation and maintenance, reduce unexpected reservoir behavior, and ultimately lower costs associated with EGS. Successful technologies developed for this purpose may also offer side benefits in applications including O&G, subsurface energy/CO₂ storage, aerospace and automotive engineering, nuclear energy, and space exploration.

Advanced Systems Integration for Solar Technologies (ASSIST); FOA # DE-FOA-0001987 [10.17.18]

Office: Solar Energy Technologies Office

Funding Number: DE-FOA-0001987

Funding Amount: \$46 million

Description

The Advanced Systems Integration for Solar Technologies (ASSIST): Situational Awareness and Resilient Solutions for Critical Infrastructure funding opportunity will strengthen the integration of solar on the electricity grid, especially at critical infrastructure sites, improve the resilience of the nation's electricity grid, and streamline technology transfer challenges. The nation's critical infrastructure is defined as the essential services that are vital to the economy, security, and health of the nation.

Solar generation can play a critical role in ensuring continuity of service at these sites during widespread disruptions from either man-made or natural threats. These projects will help to develop tools that enhance the situational awareness of solar systems on both the distribution and transmission grid and validate technologies that improve the security and resilience of the grid.

Applicants are encouraged to work with state, local, tribal, and territory owners and operators to take proactive steps to manage risk and strengthen the security and resilience of the nation's

critical infrastructure. On receiving an award, recipients will be required to submit interoperability and cybersecurity plans that detail how they will implement and maintain these aspects of their solution.

There are two interrelated areas of interest in this funding opportunity:

- **TOPIC 1.1: R&D and Technology Transfer for Solar Situational Awareness**

The office seeks to fund unique and innovative solutions that increase grid operators' situational awareness of solar PV systems deployed throughout the electricity system at strategic locations. These tools are expected to improve resilience of the nation's critical infrastructure and can help to ensure continuity of service during widespread disruptions from either man-made or natural threats. Projects should also show how a fleet of multiple solar systems in different locations could respond to fast-changing conditions under normal operations and could provide power to critical loads during grid outages.

- **TOPIC 1.2: R&D, Technology Transfer and Validation of Proactive Resilience Solutions**

The office seeks projects that go beyond the research and development to include a field validation phase. Field tests should demonstrate how these solutions can enhance resiliency of the grid with high penetrations of solar systems. These solutions should identify the strategic location of solar PV systems that will ensure that critical infrastructure will have power during widespread disruptions from either man-made or natural threats. These projects must demonstrate how the technology solutions result in greater resilience of the nation's critical infrastructure.

Prior to submitting a full application for this opportunity, a mandatory letter of intent is due on November 14, 2018 at 5:00PM ET. A concept paper is not required for this funding opportunity. All application deadlines are in the table below.

Key Dates

FOA Issue Date: October 15, 2018

Letter of Intent Due Date: November 14, 2018 5:00pm ET

Submission Deadline for Full Applications: December 7, 2018 5:00pm ET

Expected Submission Deadline for Replies to Reviewer Comments: February 1, 2019 5:00pm ET

Expected Date for EERE Selection Notifications: March 22, 2019

Expected Timeframe for Award Negotiations: 60 days

Additional Information

[Download the full funding opportunity on the EERE Exchange website](#)

[Read the EERE press release about this funding opportunity announcement](#)

For FOA-specific support, contact SI.FOA.SETO@ee.doe.gov

See more [funding opportunities from SETO](#) and [sign up for our newsletter](#) to keep up to date with the latest news.

USDA Small Business Administration Phase One Grants [9.11.18]

The Small Business Innovation Research (SBIR) program at the U.S. Department of Agriculture (USDA) offers competitively awarded grants to qualified small businesses to support high quality research related to important scientific problems and opportunities in agriculture that could lead to significant public benefits. The program stimulates technological innovations in the private sector and strengthens the role of federal research and development in support of small businesses. The SBIR program also fosters and encourages participation by women-owned and socially or economically disadvantaged small businesses.

General Information

The objectives of the SBIR Program are to:

- stimulate technological innovations in the private sector;
- strengthen the role of small businesses in meeting Federal research and development needs;
- increase private sector commercialization of innovations derived from USDA-supported research and development efforts; and
- foster and encourage participation by women-owned and socially and economically disadvantaged small business firms in technological innovations.

The USDA SBIR program office directs all activities required under the SBIR law and executes the policy established by the Small Business Administration. The SBIR program at USDA is administered exclusively by the National Institute of Food and Agriculture (NIFA). SBIR program awards are based on the scientific and technical merit of investigator initiated ideas. The SBIR Program does not make loans and does not award grants for the purpose of helping a business get established.

SBIR Phase I grants are limited to \$100,000 and duration of 8 months and are open to any small business concern that meets the SBIR eligibility requirements. SBIR Phase II grants are limited to \$600,000 and duration of 24 months and are only open to previous Phase I awardees. SBIR program funds are allocated in proportion to the number of proposals received over 10 broad topic areas. Proposals are reviewed through a confidential peer review process using outside experts from nonprofit organizations. All applicants receive verbatim copies of reviews.

Participation by university faculty or government scientists in SBIR projects is strongly encouraged. They can serve as consultants or can receive a subcontract (in both cases limited to no more than 1/3 of the Phase I award or 1/2 of the Phase II award) and continue to work full time at their institution. University faculty or government scientists can also serve as a PI if they reduce employment at their institution to 49 percent for the duration of the grant.

Small Business Innovation Research (SBIR) Topics

- Forests and Related Resources
- Plant Production and Protection - Biology

- Animal Production and Protection
- Air, Water and Soils
- Food Science and Nutrition
- Rural Development
- Aquaculture
- Biofuels and Biobased Products
- Small and Mid-Size Farms
- Plant Production and Protection – Engineering

Application Deadline: October 25, 2018

ARPA-E's Grid Optimization (GO) Competition [7.25.18]

The purpose of this FOA is to fund research and development of solution techniques that will be used by awardees to compete in Challenge 1 of the Grid Optimization (GO) Competition. The GO Competition is a series of prize challenges to accelerate the development and comprehensive evaluation of grid software solutions. The first GO Competition, Challenge 1, is an algorithm competition focused on the security-constrained optimal power flow (SCOPF) problem for the electric power sector.

Existing grid software was designed for a power grid centered on conventional generation and transmission technologies. Recent years have seen major developments in new types of resources including distributed energy resources (DER), intermittent resources (wind and solar), and storage. Such emerging technologies have unique characteristics distinct from conventional resources. Emerging technologies face a prohibitive barrier within large-scale grid operations as existing software support systems do not acknowledge these unique characteristics with the same level of accuracy and efficiency with which they capture conventional resources. As a consequence, this existing software paradigm does not allow for these assets to be used to their full potential. Furthermore, the ever-increasing emphasis on grid resilience demands innovative management of a more diverse resource portfolio, which existing grid software is not equipped to handle without overly simplifying assumptions. Simply put, in order to improve grid resiliency, the power industry must significantly advance grid software. ARPA-E is seeking submissions that describe novel techniques to solve this security-constrained optimal power flow problem; such a description includes, but is not limited to, alternative formulations of the problem, approximations, heuristic approaches, decomposition techniques, etc.

Critical issues to discuss in the application submitted to this FOA include, but are not limited to:

- Technical details regarding the proposed approach and its applicability to large-scale, non-convex, mixed integer programs (MIP). In particular, relate the proposed effort to the problem of SCOPF and the specific formulation for Challenge 1.
- Quantitative comparisons of the proposed algorithmic approach to other state of the art SCOPF approaches and/or other generalized non-convex MIP approaches as well as provide initial evidence that the proposed approach is promising.
- Complexity of the two-stage structure (the first-stage is the pre-contingency state and the second stage is the post-contingency state) related to real power and reactive power response; approaches that ignore these complexities will be considered non-responsive.

- Complementarity modeling imposed in relation to recourse decision variables related to the real power response (i.e., participation factor driven generator response) and reactive power response (i.e., PV/PQ switching).
- Handling of the non-convexities in the network flow problem.
- Proposed approaches in terms of the GO Competition scoring criteria (<https://gocompetition.energy.gov/challenges/challenge-1/scoring>) and strengths and weaknesses related to finding the lowest objective function value, satisfying constraints, algorithm run-time and robustness/ability to find feasible points.
- How the proposed solution differs from state-of-the-art approaches, including citations of any pertinent literature.

Award Size: \$5 million in federal funding is expected to be available for new awards under this announcement. Maximum award size \$250,000.

Expected Number of Awards: One, multiple, or none.

To apply to this FOA, Applicants must register with and submit application materials through [ARPA-E eXCHANGE](#).

American-Made Solar Prize; FOA # N/A (Competition administered by National Renewable Energy Laboratory on behalf of DOE/EERE Solar Energy Technologies Office) [7.2.18]

The American-Made Solar Prize is a \$3 million prize competition designed to accelerate and sustain American solar innovation through a series of contests and the development of a diverse and powerful support network that leverages National Laboratories, energy incubators, and other resources. For more information, please visit for more.

Pilot Program for Transit-Oriented Development (TOD) Planning [5.24.18]

As outlined in statute, the Pilot Program for TOD Planning is intended to fund comprehensive planning that supports economic development, ridership, multimodal connectivity and accessibility, increased transit access for pedestrian and bicycle traffic, and mixed-use development near transit stations. The program also encourages identification of infrastructure needs and engagement with the private sector.

Consistent with statutory direction, FTA is seeking comprehensive planning projects covering an entire transit capital project corridor, rather than proposals that involve planning for individual station areas or only a small section of the corridor. To ensure any proposed planning work reflects the needs and aspirations of the local community and results in concrete, specific deliverables and outcomes, transit project sponsors must partner with entities with land use planning authority in the transit project corridor to conduct the planning work.

The Pilot Program for TOD Planning helps support FTA's mission of improving public transportation for America's communities by providing funding to local communities to integrate land use and transportation planning around a new fixed guideway or core capacity improvement project. Per statute, any comprehensive planning funded through the program must examine ways

to improve economic development and ridership, foster multimodal connectivity and accessibility, improve transit access for pedestrian and bicycle traffic, engage the private sector, identify infrastructure needs, and enable mixed-use development near transit stations.

Efficient Drilling for Geothermal Energy FOA # DE-FOA-00018880 [5.2.18]

The mission of 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. Geothermal energy is a domestic energy resource from the heat of the earth, which represents a clean, efficient, and nearly inexhaustible energy source. Geothermal energy is a renewable power source that is always available; when used to generate electricity, geothermal achieves a high capacity factor that is second only nuclear power for all utility scale generation¹. The current domestic installed geothermal capacity is over 3.8 gigawatts (GW). It is estimated there is a vast 100+ GW potential in additional domestic geothermal development accessible in undiscovered hydrothermal and enhanced geothermal systems (EGS)²; however, technological innovation is required for industry to economically convert these resources into useful energy services.

GTO's technology portfolio includes early-stage R&D in EGS, hydrothermal, and low temperature and co-produced resources. This research helps to reduce the high risk associated with early stage R&D that supports the continued efforts of the geothermal industry. The geothermal industry operates in a harsh subsurface environment with unique technical and operational challenges. Foremost among those challenges is that the resource is "out of sight" at a depth of approximately 2 to 5 kilometers, in hard, abrasive rock formations at elevated temperatures and pressures well beyond those typically encountered in oil, gas, or other subsurface operations. Consequently, DOE involvement in early stage R&D enables the geothermal sector to develop cutting-edge technologies and innovation that expands the potential for domestic geothermal energy growth and future production in new geographical regions of the country.

Early-stage R&D in drilling technologies presents an opportunity for innovation that can have a big impact in making new geothermal development more economical. Drilling operations can be up to 50% of the cost of geothermal development³. Given that much of the drilling occurs in the early stages of a project, complications from drilling failures can lead to cascading consequences resulting in overall project failure. Enabling the geothermal industry to drill more efficiently can reduce both the risk and cost and would help spur industry to expand capacity in the near-term.

An increase in the deployment of domestic geothermal energy as a renewable power source has many benefits to the nation. Because geothermal electricity generation has a high capacity factor and no fuel costs, additional deployment of geothermal will increase grid reliability, bolster national energy security, and keep energy prices stable to make it more affordable for millions of Americans.

The drilling literature⁴ defines many various activities that determine drilling success. While, the rate at which a well is drilled is only one of several performance parameters that influence drilling efficiency, GTO opts to measure efficient drilling in this FOA using the average penetration rate of a geothermal drilling operation in depth vs. days (DvD). For consistency, this FOA considers drilling operations to include pre-spud engineering and wellhead equipment activities. While this

deviates from analysis for the upcoming DOE GeoVision Report⁵ which also includes mobilization/demobilization and site preparation times in drilling operation, research and development in these areas are outside of the scope of this FOA.

A survey of domestic geothermal injection and production wells drilled between 2005-2010 in Nevada and California are shown in Figure 1. This data shows that an average domestic geothermal injection/production well is drilled with a DvD of 125 feet per day, but also demonstrates a large variability in the drilling rates. While there are limited examples of geothermal wells achieving a DvD more than double the average rate, it is more much common for geothermal wells to be drilled at significantly slower rates.

TOPIC AREA 1: REDUCING NON-DRILLING TIME

Topic Area 1 will focus on early stage R&D projects that show the ability to reduce NDT. For this FOA, the general definition of NDT is adopted from Lowry et al.⁹ as “time spent over the drill rig without deepening the hole and encompasses ‘flat time’, ‘non-productive time’, and ‘trouble time’”. Flat time is defined as activities that do not advance or deepen the wellbore such as: planned trips, running casing, cementing, and wireline logging operations. Trouble time is defined as addressing issues in the wellbore such as lost circulation, stuck pipe, cementing difficulties, or an unstable wellbore. Non-productive time is defined as unplanned activities and drilling related inefficiencies such as: equipment malfunctions, unscheduled trips, or labor issues.

⁹ Lowry et al., 2017, “Reservoir Maintenance and Development Task Report for the DOE Geothermal Technologies Office GeoVision Study” SAND2017-9977

Responsive proposals to this topic area will be for early stage R&D projects that lead to significant reductions in NDT for drilling in geothermal conditions. Technical areas of interest include, but are not limited to:

- Real-time data analysis and/or machine learning algorithms that enable rig automation,
- Educational methodologies that support workforce culture improvements,
- Technologies that enable casing while drilling and/or monobore completions,
- Innovative technologies that can mitigate trouble time from lost circulation events, and
- Improving the amount drilled per bottom hole assembly to reduce tripping.

EERE anticipates 2-5 awards under Topic Area 1. Individual awards in Topic Area 1 may vary between \$1,000,000 - \$2,000,000, and have up to 24 month project duration. This Topic Area has a cost share requirement of 20%. The Recipient must provide 20 % of total project costs. (Total Federal share plus Recipient cost share equals total project costs.)

TOPIC AREA 2: ADVANCED DRILLING TECHNOLOGIES

Topic Area 2 will focus on early stage R&D projects in innovative drilling technologies that improve the rates of penetration for drilling geothermal wells. As described by Lowry et al.⁹, the process of drilling a geothermal well includes downhole energy transfer, rock reduction, rock removal, borehole stabilization, formation fluid control, logging, and borehole preservation. Topic Area 2 seeks applications that will develop new technologies that increase performance qualifiers during geothermal well drilling, and/or applications that develop methodologies that will allow geothermal wells to be drilled more efficiently with existing technologies.

Responsive proposals to this topic area will be for early stage R&D projects that result in a significant increase of ROP for drilling in geothermal conditions. Technical areas of interest include, but are not limited to:

- Innovative drilling methods, materials, and/or technologies that are tailored to increase ROP in geothermal conditions,
- Improvements in vibration control and/or use of mechanical specific energy to increase bit durability while maintaining or improving ROP, and
- Advancements in steering efficiency that improve directional responsiveness.

EERE anticipates 1-4 awards under Topic Area 2. Individual awards in Topic Area 2 may vary between \$1,000,000 - \$2,000,000, and have up to 24 month project durations. This Topic Area has a cost share requirement of 20%. The Recipient must provide 20 % of total project costs. (Total Federal share plus Recipient cost share equals total project costs.)

TOPIC AREA 3: INNOVATIVE PARTNERSHIP MODELS

Topic Area 3 will explore innovative approaches and models to accelerate the transfer of geothermal drilling and related technologies from the laboratory into the real world by focusing on building partnerships that will increase adoption of nascent technology and improve tacit knowledge transfer in the geothermal industry.

Rather than funding research on individual technology solutions directly, applicants will research and develop new methods to advance research portfolios of geothermal drilling (and related) technologies and overcome challenges endemic to the geothermal technology transfer space, including knowledge gaps between the research/industrial communities. 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, structures to incentivize industry-researcher collaboration, approaches to lower barriers such that new entrants can leverage existing facilities, methods to leverage underutilized data and facilities (such as methods that incentivize data sharing across the geothermal and other subsurface industries), and methods to drive down the cost and accelerate processes around technology validation and certification.

While funding early stage R&D is critical for EERE to achieve its mission, with this topic GTO solicits proposals that will complement those efforts. EERE seeks impactful mechanisms for improving the ways in which competitive geothermal technologies can reach the market, and provides funding to help develop and test those mechanisms for potential broad adoption by the geothermal private sector. This funding is intended to support the required work to evaluate the viability of new models (such as personnel time, legal services, financial modeling, partner involvement, and leverage for additional funds), and analysis of the outcomes.

Successful projects will enable the market adoption of various disruptive geothermal energy solutions. Lead applicants may include, but are not limited to, educational institutions, incubators/accelerators, nonprofit entities, industry associations, corporations, and investment/financial/insurance firms. DOE/NNSA Federally Funded Research and Development Centers (FFRDCs) are eligible to apply for funding as a Subrecipient, but are NOT eligible to apply as a Prime Recipient to this Topic Area.

EERE envisions funded projects to be high-leverage, with the potential to effect significant improvements within the geothermal innovation ecosystem with limited capital. Proposed

approaches, if successful and adopted at scale, should have the potential to induce a step change in how geothermal energy technologies achieve market entry. Proposals must present a plan to test the viability of the proposed approach by the end of the first year, and to quantify the value of the approach to private sector partners. Relevant partners (such as subsurface industries and service companies; international partners; and validation, testing, and manufacturing facilities) should be integrated into the proposed approach in a manner that guarantees their direct involvement. New mechanisms or models should be tested with appropriate technology validation and data sharing partners that can demonstrate the greatest interest to the geothermal market, rather than with pre-selected teams (such as those associated with a specific organization). Proposals should articulate how solutions of greatest interest to the market will be selected. Examples of successful applications under this topic area include, but are not limited to:

- Models to better incentivize collaboration and sharing of data and/or best practices across the geothermal and other subsurface industries, both domestic and international.
- Third-party validation and/or agreement structures to help reduce risk of adopting nascent drilling technologies in the geothermal industry.
- The development and implementation of new business practices that better identify and address the geothermal industry needs.

Because of the focus of this FOA, GTO primarily envisions applications to this topic area to be specifically focused on drilling technologies; however, since Topic Area 3 is technology agnostic other types of geothermal-specific business models are also encouraged to apply. Awardees selected under this topic area will be required to convene quarterly meetings of a new geothermal drilling community of practice with all awardees of this FOA to facilitate partnership development within the geothermal community.

EERE anticipates up to 3 awards under Topic Area 3. Individual awards in Topic Area 3 may vary between \$500,000 - \$1,000,000, and have up to 24 month project durations. This Topic Area has a cost share requirement of 20%. The Recipient must provide 20 % of total project costs. (Total Federal share plus Recipient cost share equals total project costs.)

Buildings EPSCoR-State/National Laboratory Partnerships; FOA # DE-FOA-0001897 [3.28.18]

The U. S. Department of Energy's Established Program to Stimulate Competitive Research (EPSCoR) program hereby announces its interest in receiving applications for building EPSCoR-State/DOE-National Laboratory Partnerships. These partnerships are to advance fundamental, early-stage energy research collaborations with the DOE national laboratories (Information on the DOE National Laboratories including links to websites can be found at <http://www.energy.gov/about-national-labs>.) Participation by graduate students and/or postdoctoral fellows is required. Junior faculty from EPSCoR jurisdictions are encouraged to apply. Utilization of DOE user facilities are encouraged. (Information on the SC User Facilities can be found at <http://science.energy.gov/user-facilities/>, information on the DOE Office of Nuclear Energy user facilities can be found at <https://atrnsof.inl.gov/>).

DOE EPSCoR currently follows eligibility determinations made by the National Science Foundation EPSCoR for its Research Infrastructure Improvement (RII) Program. As a result,

entities located within the following jurisdictions will be eligible to apply under this FOA: Alabama, Alaska, Arkansas, Delaware, Guam, Hawaii, Idaho, Kansas, Kentucky, Louisiana, Maine, Mississippi, Montana, Nebraska, Nevada, New Hampshire, North Dakota, Oklahoma, Puerto Rico, Rhode Island, South Carolina, South Dakota, Vermont, Virgin Islands, West Virginia, and Wyoming.

Flexible Combined Heat and Power for Grid Reliability and Resiliency; FOA # DE-FOA-001750 [2.21.18]

The DOE/EERE Advanced Manufacturing Office released a \$10 million funding opportunity announcement (FOA) to conduct research and development activities to further the utilization of cost-effective, highly efficient combined heat and power (CHP). CHP is a suite of predominately gas-fired distributed generation technologies that produce both electricity and thermal energy onsite, thereby providing the user with more efficient and lower cost electricity while at the same time increasing site reliability and energy security. In addition, CHP can reduce line losses and strain on grid infrastructure. The promotion of CHP is part of the DOE/EERE mission to create and sustain American leadership in the transition to a strong and prosperous America powered by clean, domestic, affordable and secure energy for the industrial, manufacturing, commercial, and multi-family sectors.

Small Business Innovation Research (SBIR) Small Business Technology Transfer (STTR) FY 2018 Phase 1 Release 2 [11.27.17]

which proposes \$16 million in Fiscal Year 2018 funding for the Phase I Release 2 FOA for multiple research and development programs throughout DOE.

Novel and Enabling Carbon Capture Transformational Technologies [10.16.17]

Development of Novel Transformational Materials and Processes: Selected projects under this area will support research developing and validating transformational materials and capture processes such as, but not limited to, novel water-lean solvents and other materials that can significantly increase CO₂ absorption performance, economics, and other benefits. Projects may also focus on advanced membranes or hybrid materials and processes that can be tested at bench-scale on natural gas and/or coal-fired flue gas, showing potential to meet DOE's transformational carbon capture goals.

Enabling Technologies to Improve Carbon Capture Systems: Selected projects under this area will support bench-scale research on addressing challenging issues associated with advanced carbon capture technologies. By developing these enabling technologies, overall improvement in carbon capture systems that is or is not specific to any one technology developer might be realized.

Integrated Biorefinery Optimization; #DE-FOA-0001689 [1.6.17]

The U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Bioenergy Technologies Office (BETO) and the U.S. Department of Agriculture (USDA), National Institute of Food and Agriculture (NIFA) announce a joint funding opportunity to support Integrated Biorefinery Optimization. DOE has funded biorefinery technology development projects, since 2002, to meet two EERE performance goals: 1) reduce dependence on imported oil, thereby enhancing energy security; and 2) spur the creation of a sustainable domestic bio-industry. USDA-NIFA has funded programs and projects that target vital topical areas related to the development of regional systems for the sustainable production of biofuels, industrial chemicals, biopower, and biobased products; as well as investing in America's scientific corps and developing workforce in bioenergy, bioproducts, and the bioeconomy. Robust scale-up of commercially viable biorefinery technologies will help USDA-NIFA meet two important goals: 1) to enhance energy security through the reduction in the dependence on foreign oil; and 2) to spur the creation of a sustainable domestic bioeconomy. This work supports NIFA's mission to accelerate deployment of energy efficiency and renewable energy technologies to strengthen U.S. energy security, economic vitality, and environmental quality.

Federal support for first-of-a-kind Integrated Biorefineries (IBRs) could significantly reduce the technical and financial risks associated with new technology deployment, thus accelerating the growth of the U.S. bioeconomy, reducing costs to consumers, enabling reductions in environmental pollution in the transportation sector and improving energy security. There are still unresolved technical and non-technical challenges within the IBRs that need to be addressed in order to achieve reliable and continuous operation that effectively competes with the petroleum refining and petrochemical industries. Many of these challenges are related to:

- Complexity and variability of non-food feedstocks;
- Operational difficulties encountered with handling of solids in the production process;
- Recalcitrance of feedstocks to efficiently convert into products;
- Inhomogeneity of intermediates resulting in non-uniform heat and mass transfer during the manufacturing processes;
- Complex multi-step separation and purification steps;
- Non-monetization of byproducts and residual streams;
- Difficulties in translating bench-scale and pilot-scale learnings to the next step in scale-up such as demonstration-scale or pioneer-scale commercial level;
- Non-competitive cost of bioproducts due to higher capital and operational expenses; and
- Shortage of capital for long-term industrial projects.

As a result of these barriers, there are only a few pioneer-scale commercial IBRs in early stages of commissioning, start-up, and/or production, and a wider deployment of highly-efficient IBR facilities is still a goal to be realized. A number of the challenges result in schedule delays,

increased capital (CapEx) and operational (OpEx) expenses, and scale-up complications. BETO has identified, via stakeholder engagements through a Request For Information (RFI) and a Biorefinery Optimization Workshop, areas in which DOE and USDA can effectively support technology development and engineering solutions to economically and sustainably overcome these critical barriers.

The FOA, which will be coordinated with and co-funded by USDA-NIFA, will identify, evaluate, and select applications proposing projects to address challenges encountered with the successful scale-up and reliable continuous operation of IBRs for the manufacture of Advanced or Cellulosic Biofuels (see Definitions) and associated higher value bioproducts. The FOA seeks applications for projects focused on addressing these challenges, reducing risks, and providing resources to accelerate commercialization of biofuels and bioproducts.

The FOA includes four topic areas as follows:

- **Topic Area 1:** Robust, continuous handling of solid materials (dry and wet feedstocks, biosolids, and/or residual solids remaining in the process) and feeding systems to reactors under various operating conditions;
- **Topic Area 2:** High value products from waste and/or other under-valued streams in an IBR;
- **Topic Area 3:** Industrial separations within an IBR; and
- **Topic Area 4:** Analytical modeling of solid materials (dry and wet feedstocks, and/or residual solids remaining in the process) and reactor feeding systems.

Regional Energy Technology Innovation Ecosystem Characterization Assessments [1.6.17]

FOA purpose is to fund analytic studies that assess the possibilities and challenges associated with developing a multi-state region's energy innovation ecosystem to meet the energy needs and opportunities of that region.

Vehicle Technologies 2017 Deployment Funding Opportunity Announcement [12.21.16]

Contains two Areas of Interest -- one seeking highly-leveraged, community-based AFV deployment projects, and another for "living lab" deployments of energy efficient "smart" mobility systems.

Sunshot Initiative Solar in Your Community Challenge; FOA # N/A (Competition administered by State University of New York Polytechnic Institute) [11.23.16]

To expand solar energy access to underserved segments, specifically low- and moderate-income (LMI) communities; State/Local/Tribal governments, and non-profit organizations.

**Geothermal Deep Direct-Use Feasibility Studies Funding Opportunity Announcement;
FOA # DE-FOA-0001601 (DOE/EERE/Geothermal Technologies Office) [11.15.16]**

The DOE/EERE Geothermal Technologies Office seeks to conduct feasibility studies of large-scale, low-temperature deep-well geothermal systems coupled with advanced direct-use applications and cascaded surface technologies whose applications will extend the reach of geothermal into geologically distinct parts of the country beyond the western United States. These systems are referred to herein as deep direct-use or DDU.

**Scaling Up the Next Generation of Building Efficiency Packages; FOA # DE-FOA-0001518
(DOE/EERE/Building Technologies Office) [10.20.16]**

The Commercial Buildings Integration (CBI) program, working in cooperation with the General Services Administration's (GSA) Green Proving Ground program, will invest \$6.5 million in a competitive Funding Opportunity Announcement (FOA). DOE seeks proposals that drive innovation in real building technology demonstrations while also fostering the collaboration of dynamic demonstration teams that include technology providers, energy organizations (states, local governments or Regional Energy Efficiency Organizations), efficient building hubs (such as Innovation or Incubator hubs), utilities, and building energy professionals. GSA will participate in the merit review of proposals and provide the option to leverage GSA host sites with portfolio deployment potential. Applicants should clearly state whether or not they would like to participate in the Green Proving Ground program as a part of their proposal.

This FOA builds off of current laboratory and simulation analysis of technology packages by investing in real building demonstrations led by strategically structured teams who will identify and verify multi-system energy efficiency packages (groups of technologies that improve efficiency across two building systems: envelope, lighting/electrical, plug, process, heating, ventilation, cooling, refrigeration, energy management and information, sensors and controls). Projects selected through this funding opportunity will prime the market for the adoption of emerging and underutilized technology packages and create new synergies between building stakeholder groups, and/or, ultimately help utilities develop and release or expand more aggressive and ambitious Energy Efficiency (EE) program offerings. This FOA also supports the critical function of evaluation, measurement and verification (EM&V) by using existing DOE tools and resources to: 1) identify the most impactful multi-system packages, 2) develop the preliminary savings calculations, 3) collect data to verify package performance along with other market factors in real buildings, and 4) foster more consistent energy efficiency programs across the country. For example, EnergyPlus building simulation tools enable the multi-system analysis of benefits and trade-offs for differing system configurations, building types and/or climates. See the BTO Analysis Tools webpage for more information on these tools and other relevant resources to support projects under this FOA, <http://energy.gov/eere/buildings/analysis-tools>. Moreover, this FOA will help create new efficiency opportunities in commercial buildings by overcoming existing and persistent barriers to the adoption of technologies on the HIT List, <http://energy.gov/eere/buildings/high-impact-technology-catalyst>, and/or with harder to calculate, indirect savings, such as envelope and controls measures. Finally, this approach helps move the market toward outcome- and performance-based goals for existing buildings. The technical and/or non-technical products of this funding will enable investment-level decision-making, and

will accelerate the development of utility programs for packages of technologies that meet cost-effectiveness thresholds.

The objective of this funding is to generate and disseminate data, case studies, and information that lowers perceived risk regarding the efficacy and economic benefits of innovative and under-utilized commercial building technology packages that can save significant amounts of energy in new and existing commercial buildings. Demonstrations of the technology packages funded under this FOA are likely to meet the investment hurdles for the commercial real estate market at scale, but may not at the current time, and will have the potential to significantly reduce energy consumption in U.S. commercial buildings. Projects funded through this opportunity will leverage current DOE resources (see the High Impact Technology Catalyst, Building Performance Database, Advanced Energy Retrofit Guides, and OpenStudio at <http://energy.gov/eere/buildings/commercial-buildings-integration>) and will be widely replicable by other energy efficiency programs.

Smart and Connected Communities (National Science Foundation) [10.1.16]

I. INTRODUCTION

Cities and communities in the U.S. and elsewhere around the world are entering a new era of transformational change, in which their inhabitants and the surrounding built and natural environments are increasingly connected by smart technologies. Concurrently, communities continue to undergo substantial changes. Some of those changes lead to new opportunities for innovation. Some are highly disruptive. There are unique opportunities to advance the frontiers of fundamental science as population demographics shift, new technologies and methods for delivering services come into being, and environmental changes continue.

The goal of this Smart & Connected Communities solicitation is to support interdisciplinary and integrative research and research capacity-building activities, while undertaking meaningful community engagement. The specific objectives of this solicitation are to: (1) enhance understanding and support the design of smart and connected communities, in ways that improve the quality of life within them; (2) foster the development of a robust, multidisciplinary and diverse research community that encompasses, integrates, and extends disciplinary perspectives in the social, behavioral, economic, and learning sciences and in computer and information sciences and engineering, and engineering research; and (3) support research capacity-building to address the challenges and opportunities of present and future smart and connected communities. The solicitation calls for activities that contribute to meaningful engagement with communities in accomplishing the above objectives.

NSF has long been a leader in supporting the basic research and education activities and partnerships that form the foundation for the Smart & Connected Communities program. Some basic research and education areas that form the foundations for this S&CC program solicitation include: (1) new methods and technologies for collecting, managing, and analyzing ever-finer and more diverse data and new algorithms that can leverage those data for a wide range of phenomena in urban, suburban, and rural settings; (2) new approaches in the modeling and design of complex sociotechnical systems to inform the construction, instrumentation, and performance of smart and connected communities; (3) research on the dynamics, characteristics, and behaviors of

individuals and communities; and (4) development of new methods and advanced technologies that support education and workforce development. Looking forward, NSF seeks research and research capacity-building efforts that span and integrate across multiple disciplines and that meaningfully engage with communities themselves.

This S&CC solicitation is part of NSF's multipronged strategy for investing in basic research on [Smart & Connected Communities](#), and is aligned with the [White House Smart Cities Initiative](#). Subject to the availability of funds, NSF envisions a multi-year S&CC program, with activities that evolve to support fundamental research, research community capacity-building, and community engagement.

II. PROGRAM DESCRIPTION

A. Overview

This solicitation calls for integrative research and research capacity-building that, when undertaken with meaningful community engagement, will secure far-reaching impacts in physical, geographically-defined communities often consisting of diverse, and varied populations. Generally, smart and connected communities are those that integrate people and information, communication, engineering and other technologies to improve the quality of life for those who live, travel, and work in them. Smart and connected communities can be considered systems of systems: physical, social, and technical. This solicitation seeks fundamental, multidisciplinary advances in understanding and designing smart and connected communities. To support the expansion and development of the S&CC research community, it also calls for projects that seek to build or leverage research capacity across a wide variety of disciplinary areas. As a third component of this solicitation, meaningful community engagement will help frame the research directions, provide access to input for such research, and provide means of understanding the results that emerge from such research efforts. Unless stated otherwise, for the purpose of this year's solicitation, **communities** are physical, geographically-defined entities, such as towns, cities, or incorporated rural areas, often consisting of various populations, with a governance structure and an ability to engage in meaningful ways with the proposed research.

B. Components

Integrative research encompasses innovation that addresses combined social and technological aspects of smart and connected communities. Among the social considerations that could result from pursuing an "integrative research" approach are improved understanding of the attitudes, behaviors, and other characteristics of community inhabitants, groups and organizations within the community, and relationships with other communities or the larger environment and institutions; processes of learning, adaptation, interaction, and collaboration; economic impacts on the community; and future opportunities for growth. Among the technological considerations that could result from taking an "integrative research" approach are data integration and management; new algorithms and modeling frameworks for understanding and exploiting high volumes of diverse and complex data; security and privacy; and innovations in the design and engineering of materials, sensors, structures, and systems in support of smart and connected communities, and improving quality of life therein. From an integrative perspective, these considerations must be explored in concert, taking into account opportunities, vulnerabilities, and possible unintended consequences of distributed, intelligent technologies embedded within communities. Illustrative integrative research topics include but are not limited to the following:

- Collection, analysis, and innovative uses of data and information from multiple heterogeneous sources to support communities in identifying economically viable and sustainable options to improve quality of life;
- Real-time adaptation of systems and infrastructure in response to changing needs and behaviors of the community by harnessing and autonomously handling data;
- Social, cultural, legal, and ethical drivers and consequences, including potential unintended consequences, of smart and connected technologies and infrastructures. For example, factors that affect technology adoption, which may include privacy and autonomy considerations;
- Infrastructure retrofit and design through advances in systems science and engineering, and in light of broader social changes in the attitudes, behaviors, and demographics of the community;
- New approaches and methods for data-driven and/or physics-based analysis and engineering of S&CC systems, while considering broader social and cultural perspectives;
- Novel methodologies, algorithms and representations for systems engineering as applied to the design, integration, operation, and maintenance of S&CC systems, considering how community inhabitants identify, evaluate, adapt to, and incorporate smart technologies;
- Novel computing technologies, and advances in theories of learning, that enable cyber-learning with consideration of distributed intelligence, knowledge-building communities, formal or informal educational environments, knowledge management, and communities of practice for a future diverse and innovative workforce;
- New technologies for improving public safety and security, including management of risks associated with highly complex infrastructures and systems, mindful of the needs and attitudes of inhabitants and legal and policy constraints;
- Fundamental research in sensing/estimation and information-theory, cooperative control, game theory applied to and influenced by smart and connected communities and their members;
- Improved understanding of interdependencies and the role of, automation and autonomy within complex, dynamic, S&CC systems; and
- Advances in machine learning and data analytics, emphasizing dynamic optimization under uncertainty for human-in-the-loop decision making in smart and connected communities.

Integrative research may cross a range of **application** domains, including but not limited to economic development, education and learning, energy, environmental quality, health and healthcare, safety, social services, telecommunications, and transportation. In addition, proposals may explore additional issues lying outside the identified integrative research topics and applications. For example, S&CC research may also involve integration with the physical and environmental sciences, urban planning, or other fields.

Research capacity-building refers to activities that further develop the interdisciplinary teams and team members that can contribute to research and applications for smart and connected communities, whether by developing plans for future research efforts and directions or in the activation of collaborations or networks to link new and ongoing efforts in novel ways. The ultimate goal of research capacity-building is to develop and attract research talent to address S&CC integrative research challenges through training, collaborations, networks, seminars, or other approaches. Such activities should be organized around strongly multidisciplinary, integrative theme(s) such as those described above, and with close community engagement.

Community engagement is an essential component of both integrative research and research capacity-building. Here, community engagement refers to substantive interaction with individuals, institutions, and other organizations in target communities as defined above. Examples of community partner organizations and anchor institutions in the public, private and not-for profit sectors include but are not limited to governments, government departments, schools, libraries, health and social service providers, non-profits, cultural organizations, and businesses. Investigators and community partners are encouraged to work closely to develop and evaluate creative approaches to achieving meaningful engagement for mutual benefit. Examples of community engagement include but are not limited to the following:

- Refining the conceptual framework of the research or defining community member needs and concerns;
- Providing facilities, resources, and/or expertise that are instrumental to enhancing community functioning;
- Identifying or supplying data and enabling the interface of that data with the proposers' research ideas;
- Conceiving of or supporting research demonstrations, experimentation, proof of concepts and/or pilot projects by enabling use of infrastructure or community services;
- Participating in "living labs" where science, technology, and engineering advances are staged iteratively through pilot studies in communities;
- Assisting in the planning for or actual evaluation of proposed research, including helping to define or create metrics and support data collection and/or interpretation within the community context; and
- Engaging or helping to define, discover, or contact other potential stakeholders.

Note, the nature of the engagement will vary for the proposal mechanisms identified below: for Planning Grants and Research Coordination Networks (RCNs), community engagement should contribute to planning and establishing research direction setting, whereas for Integrative Research Grants (IRGs), the community engagement is expected to be more substantive as described below.

<https://nsf.gov/pubs/2016/nsf16610/nsf16610.htm>

Sensor and Modeling Approaches for Enhanced Observability and Controllability of Power Systems with Distributed Energy Resources (DERs); FOA # DE-FOA-0001616 (DOE Office of Electricity Delivery and Energy Reliability) [9.26.16]

The Department of Energy (DOE), National Energy Technology Laboratory (NETL), on behalf of the Office of Electricity Delivery and Energy Reliability (OE), is seeking applications under this Funding Opportunity Announcement (FOA), herein referred to as Announcement, to conduct research, development and demonstrations (RD&D). This RD&D, in the areas of low cost sensors and improved modeling using sensor data input, will lead to enhanced observability and controllability of power systems to support increased hosting capacity for distributed energy resources (DERs), including energy storage. Capturing the benefits commonly attributed to DERs and/or microgrids, as well as establishing new value propositions that could be enabled by these RD&D efforts is the focus of this FOA. New value propositions could include, but are not limited

to, mitigating ancillary resource requirements and meeting the growing demand for reliable and resilient grid operations against outages under all-hazards conditions.

The DOE Grid Modernization Initiative (GMI) was launched to transform a 20th century grid model of largely centralized generation and independently controlled loads to one of a seamlessly integrated grid with both centralized and distributed generation and participatory, coordinated loads. This transformation is in part driven by a growing number of DER deployments of dispatchable (controllable) and non-dispatchable resources connected to the distribution infrastructure on the utility and/or customer side of the meter. DERs include distributed generation (solar photovoltaics (PV), wind, combustion engines, combined heat and power (CHP), microturbines, micro hydro power, and fuel cells), electric vehicles, building technologies, energy storage, and demand response.

Key benefits of DER to electric utilities and their customers include energy savings, avoided system losses, deferred or avoided network investments, improved resilience and power quality, and customer participation. However, high penetration levels of DERs also bring about new challenges to managing grid operations: adding more variability and load forecast errors, increased complexity in circuit connectivity and communications topology, two-way power flows, and inadvertent system dynamics from interactions among DERs and between DERs and the distribution system, as well as others. These challenges must be overcome to realize the full extent of benefits that DERs can provide.

Community Solar Challenge FOA # DE-FOA-0001614 [7.19.16]

This \$5 million challenge competition's goal is to demonstrate a large number of community solar installations in a wide diversity of jurisdiction across the United States, while expanding access to solar electricity. Through the challenge, teams will create local community solar assets for scalable business practices, while building local capacity around the legal, technical, financial, and administrative aspects of community solar programs and projects. Teams will complete key milestones towards completing their community solar programs and projects, including project finance, customer acquisition, subscriber management, PV system engineering, installation, interconnection, and operations and maintenance of community solar projects.

Cities Leading through Energy Analysis and Planning (Cities-LEAP); FOA # DE-FOA-0001403 [3.23.16]

The FOA's purpose is to support the development and piloting of data-driven decision frameworks by local and tribal governments. These frameworks should advance model practices and processes that improve the ability of local and tribal governments to integrate, analyze, and understand varied datasets, in order to pursue opportunities across all clean energy sectors such as sustainable transportation, energy efficiency, and renewable power.

Beyond Traffic: The Smart City Challenge [12.7.15]

The vision of the Smart City Challenge is to demonstrate and evaluate a holistic, integrated approach to improving surface transportation performance within a city, and integrating this approach with other smart city domains such as public safety, public services, and energy.