

Funding Opportunity Announcements

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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.

Energy-Water Desalination Hub [6.21.18]

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

This FOA supports the establishment of an Energy Innovation Hub in the area of Energy-Water Desalination (referred to as the “Hub”) to accelerate transformational advances in science and engineering focused on reducing the energy and cost requirements of desalination to provide clean and safe water¹. 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.

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

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

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

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

EERE plans to issue the FOA on or about July 2018 via the [EERE Exchange website](#). If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange.

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.

Advanced Systems Integration for Solar Technologies (ASSIST)

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.

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.

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

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.

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](#).

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.

EEERE 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.