Funding Opportunity Announcements
City of Pittsburgh MOU

Table of Contents

Open Funding Opportunities

Previous Funding Opportunities

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DOC EDA FY 2021 American Rescue Plan Act Build Back Better Regional Challenge Notice of Funding Opportunity (NOFO) (ARPA BBBRC NOFO) [7.22.21]

FOA Issue Date: July 22, 2021
Submission Deadline for Phase I Concept Proposals: October 19, 2021
Submission Deadline for Phase 2 Full Applications: March 15, 2022

Available Funding: $1,000,000,000
Award Size per Project: $500,000 - $25,000,000
Period of Performance: 12 months – 48 months
Eligibility: District Organization of an EDA-designated Economic Development District (EDD); Indian Tribe or a consortium of Indian Tribes; State, county, city, 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; institution of higher education or a consortium of institutions of higher education; or public or private non-profit organization or associating acting in cooperation with officials of a general purpose political subdivision of a state
Cost Share: 0% cost share for Phase 1, 0% - 20% cost share for Phase 2

Overview
EDA's mission is to lead the Federal economic development agenda by promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy. Through this American Rescue Plan Act Build Back Better Regional Challenge Notice of Funding Opportunity (ARPA BBBRC NOFO), EDA aims to assist communities and regions impacted by the coronavirus pandemic. The pandemic has caused, and continues to cause, economic injury to U.S. communities and regions in devastating and unprecedented ways. This ARPA BBBRC NOFO is designed as a two-phase competition to (1) help regions develop transformational economic development strategies and (2) fund the implementation of those strategies that will create and grow regional growth clusters. Such efforts will help regional economies recover from the pandemic and build economic diversity and resiliency to mitigate impacts of future economic disasters as well as benefit regional workforces and residents through creation of high-quality jobs, increased wages, and revitalized communities.

This ARPA BBBRC NOFO will be administered in two phases:

- In Phase 1, EDA will provide technical assistance grants to approximately 50-60 coalitions (through an eligible entity that serves as a lead institution). These coalitions will be considered "finalists" and the grants will be used by the finalists to prepare more detailed applications for transformational projects that benefit their respective geographic regions and are aligned around a holistic approach to building, strengthening, or scaling a strategic industry or industries.
- In Phase 2, EDA will select 20-30 of the finalist coalitions to receive $25-75 million (and potentially up to $100 million) each to fund the collection of projects they identified. The projects will be funded through grants to coalition members.

While geographic diversity is encouraged, the applicant's footprint should be designed and bounded in a way that ensures maximum collaboration and impact. The target region could correspond closely to statistical labor market areas such as metropolitan and micropolitan statistical areas, or to an industry that may be geographically dispersed but has unusually strong connectivity due to an established coalition of local government, industry, labor, and academic leaders. Regional growth clusters might reflect a hub and spoke model, anchored around a "hub" such as a city, business park, port, educational or research institution, or technology center, and complemented by significant investment strategies in multiple "spokes" that represent demographic and geographic diversity. Coalitions should clearly articulate how the chosen geographic footprint presents potential for globally competitive industries and a purposeful approach to ambitious yet actionable economic transformation, leading to quality jobs,1 long-term economic competitiveness, and creates stronger urban-rural linkages or stronger rural regional growth clusters. Regardless of the geographic and economic characteristics of the regions, it must be clear how the proposed projects will address economic distress, both historical challenges and those created by the global pandemic.

Although supported by several distinct projects, each regional growth cluster should be interconnected and work to drive competitiveness at a transformational scale, and be linked to a long-term strategic planning developed with community involvement. Examples of illustrative regional growth clusters include:

- Establishing an artificial intelligence (AI) corridor by funding: (1) planning and feasibility studies to develop critical, modern infrastructure for the corridor; (2) roads and modernized utilities to grow local industrial parks; (3) entrepreneurship and commercialization programs to capitalize on AI innovations; (4) workforce training programs with wrap-around services to support growing technology companies; (5) rural manufacturing supply chain planning to integrate more local manufacturers into the cluster and coordinated skilling efforts for their workforce as they adopt new technologies; (6) a rural energy biomass project; and (7) upgrades to a manufacturing facility owned by an eligible entity to ensure global readiness and competitiveness. Such a cluster might include a significant commitment from a leading university to build a new AI program or supply locally-generated technology for commercialization.
- Scaling an agriculture-technology cluster in rural coal counties by funding: (1) unmanned aerial vehicle (UAV) technology commercialization and entrepreneurship support programing in a downtown university center; (2) the expansion of STEM and agriculture oriented workforce training centers in rural community colleges; (3) water irrigation infrastructure to increase crop resiliency and water usage efficiency across a region; (4) statewide supply chain planning to address seasonal inefficiencies due to crop cycles and build on local and regional food systems or increase national and international reach; and (5) a multi-county revolving loan fund to provide gap financing for agriculture-technology-centered small businesses. Such a cluster might include significant commitments from industry to procure and support technologies commercialized from the state university and partner with farmers to test new technologies and practices.
- Growing a blue economy cluster (e.g., the sustainable use of ocean and coastal resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean and coastal ecosystems) in a multi-county region that crosses State lines by funding: (1) long-term strategic planning related to supply chain resiliency through expansion and co-locating downstream suppliers; (2) key infrastructure investments like roads, sewer, water, and broadband to facilitate development of industrial parks and ports for blue economy parts suppliers and manufacturers; (3) critical workforce infrastructure at local community colleges to ensure a skilled and prepared workforce; (4) integrated and advanced workforce plans and strategies to link up related sectors; and (5) R&D and commercialization related to key industries. Such a cluster might also have employment commitments for the newly trained workforce from local start-up or expanding companies, and leverage other state and local blue economy infrastructure investments.

- An area historically reliant on the automotive industry wants to create a climate-friendly electric vehicle cluster by funding: (1) a new battery and lightweight composite materials research program and associated facilities at a local university; (2) a new non-profit workforce training center that focuses on the skills required by regional battery and automotive manufacturers; (3) an entrepreneurial center that focuses on commercializing new automotive technologies at start-up firms; and (4) programmatic support for a technology seed fund managed by a local CDFI.

DOC EDA FY 2021 American Rescue Plan Act Economic Adjustment Assistance Notice of Funding Opportunity (NOFO) (ARPA EAA NOFO) [7.22.21]

FOA Issue Date: July 22, 2021
Application Deadline: March 31, 2022

Available Funding: $500,000,000
Award Size per Project: $500,000 - $5,000,000
Period of Performance: 12 months – 48 months
Eligibility: District Organization of an EDA-designated Economic Development District (EDD); Indian Tribe or a consortium of Indian Tribes; State, county, city, 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; institution of higher education or a consortium of institutions of higher education; or public or private non-profit organization or associating acting in cooperation with officials of a general purpose political subdivision of a state
Cost Share: 0% - 80%

Overview
EDA's ARPA EAA NOFO is designed to provide a wide-range of financial assistance to communities and regions as they respond to, and recover from, the economic impacts of the coronavirus pandemic, including long-term recovery and resilience to future economic disasters. Under this announcement, EDA solicits applications under the authority of the Economic Adjustment Assistance (EAA) program, which is flexible and responsive to the economic development needs and priorities of local and regional stakeholders. This is the broadest NOFO EDA is publishing under ARPA and any eligible applicant from any EDA Region may apply. EDA expects to fund a number of projects under this NOFO that support communities negatively impacted by the downturn in the coal economy, supporting transitioning away from coal.

Through the EAA program, EDA provides investments that support a wide range of non-construction and construction activities in regions experiencing severe economic dislocations, such as those brought about or exacerbated by the coronavirus pandemic. Through this program, EDA can support both the development of pandemic recovery strategies and the implementation of recovery projects identified with those strategies. This includes construction activities such as water and sewer system improvements, industrial parks, high-tech shipping and logistics facilities, business incubators and accelerators, brownfield redevelopment, technology-based facilities, wet labs, multi-tenant manufacturing facilities, science and research parks, workforce training facilities, and telecommunications infrastructure (e.g., broadband) and development facilities. This also includes non-construction activities such as design and engineering, technical assistance, economic recovery strategy development, and capitalization of revolving loan funds (RLFs).

Note that this ARPA EAA NOFO is intended to fund non-construction and construction activities not already part of another NOFO promulgated by EDA to implement the American Rescue Plan Act. In particular, if a specific non-construction or construction project is part of the Build Back Better Regional Challenge NOFO it will only be considered under this ARPA EAA NOFO to the extent that the Build Back Better Regional Challenge package of projects was not selected. If an applicant has inadvertently applied to the incorrect NOFO, or if a Build Back Better Regional Challenge package is not selected, EDA in its discretion may move the project to the more appropriate NOFO. Indigenous communities are eligible to apply under any ARPA NOFO, though EDA may in its discretion move applications between this NOFO and the Indigenous Communities NOFO.

In EDA's experience with post-disaster recovery, the most effective rebuilding efforts are based on long-term regional development or redevelopment strategies that leverage Federal funding in coordination with state, local, and private sector resources. For this reason, EDA encourages the submission of applications based on long-term, regionally oriented, coordinated, and collaborative economic development or redevelopment strategies that foster economic growth and resilience. This includes plans aimed at building stronger regional economic links between urban centers and rural areas.

It is important that investments support the economic recovery through strong employment opportunities for workers, including but not limited to opportunities for workforce development, rehiring of laid off workers, and creating and retaining union jobs and well-paying jobs with good benefits. Moreover, it is important that investments in infrastructure and construction projects be carried out in ways that produce high-quality infrastructure, avert disruptive and costly delays, and promote efficiency. EDA understands the importance of promoting workforce development and encourages recipients to ensure that construction projects use strong labor standards, including project labor agreements and community benefit agreements that offer wages at or above the prevailing rate and include local hire provisions to promote effective and efficient delivery of high-quality infrastructure projects, as well as the economic recovery. Using these practices in construction projects may help to ensure a reliable supply of skilled labor that would minimize disruptions, such as those associated with labor disputes or workplace injuries.

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.

DOE EERE BTO 2021 Laboratory Cooperative Research and Development Agreement (CRADA) Call [4.15.21]

BTO Laboratory CRADA Call Release Date: April 15, 2021
Deadline for Notice of Intent to Apply: April 30, 2021
Deadline for Proposal Submission: May 14, 2021
Selection and Announcement of Awards Made: July 2021 Anticipated

Number of Awards: 11 – 23
Available Funding: Up to $8,500,000
Award Size per Project: $400,000 - $2,000,000
Period of Performance: Up to 3 years
Prime Recipient Eligibility: DOE national laboratories
Subrecipient Eligibility: for-profit entities; educational institutions; non-profits that are incorporated (or otherwise formed) under the laws of a particular state or territory of the United States and have a physical location for business operations in the United States; U.S. state, local, and tribal government entities
Cost Share: 10% - 50% (see solicitation for details)

Objective
Through this request for proposals being issued by NREL, DOE BTO seeks to accelerate the development of emerging building technologies and address barriers to their commercialization and acceptance in the marketplace by cost-sharing collaborative research, development, and demonstration (RD&D) projects. Up to $8.5 million will be made available to national laboratories working on collaborative projects that involve one or more DOE national laboratories and non-lab partners.

Areas of Interest
AOI 1: Automated and Continual Commissioning of Building Energy Management Systems
Participating Labs**:** Lawrence Berkeley National Laboratory (LBNL), NREL, Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL)
Estimated DOE Funding Available: Up to $2 million
Estimated Number of Projects: 2

Automated and continual commissioning reduces deployment costs of controls, extends equipment life, reduces the possibility of failures, and saves energy. Systems components must automatically share their identity, status, and availability with advanced building controls and operate successfully as an integrated system when necessary. Some examples of contributing technologies include self-identifying equipment, self-configuring controls, automatic verification of installation, continual monitoring and testing, and self-diagnosis of faults and degradation.

This topic seeks proposals to advance automated and continual commissioning of integrated energy management systems in commercial buildings to reduce control installation and upgrade costs. An area of particular interest is the automation of point mapping processes and standardization of control sequences and verification tests in an open and digital format to streamline the installation and implementation process for building energy management systems in the building design or retrofit phase.

Proposals should describe the current state of the technology of focus, the intended application space (e.g., building type), and targeted metrics.

AOI 2: Advancing Optimization-based Autonomous Building Energy Management

Participating Labs: LBNL, NREL, ORNL, PNNL
Estimated DOE Funding Available: Up to $2 million
Estimated Number of Projects: 4

This topic seeks proposals to advance optimization-based integrated energy management systems in commercial and residential buildings. The technology should be capable of handling multiple objectives (e.g., reduce energy costs, improve occupant comfort, provide resilient operations during extreme weather events, reduce emissions, load shaping) while being robust in light of uncertainties related to weather, occupancy, sensing, etc. Proposals should highlight capabilities not commonly found in legacy systems—economic solutions for small commercial buildings, retrofit solutions for split-incentive buildings, auto-calibration and self-learning, semantic interoperability compliance/capabilities, cybersecurity features, explainable (intelligible) solutions, automated fault detection and diagnostics, and others. Proposals should describe the current state of the technology of focus, the intended application space (e.g., building type), and targeted metrics.

AOI 3: Envelope Technologies

Participating Labs: Argonne National Laboratory, LBNL, NREL, ORNL, PNNL
Estimated DOE Funding Available: Up to $1.5 million
Estimated Number of Projects: 2–6

The opaque envelope affects 25% of building energy use or 10% of total U.S. primary energy use. Improving the energy performance of the opaque envelope is critical to reducing total building energy use. Retrofits are crucial to realizing the energy savings potential of the opaque envelope because nearly 85% of residential buildings and 55% of commercial buildings that exist today will still exist in 2050.

Novel opaque envelope technologies could dramatically reduce building energy use while simultaneously delivering additional benefits—comfort, well-being, and productivity—for building owners and occupants. To maximize impact, these novel envelope technologies and approaches need to be advanced to the market, validated, demonstrated in the field, and ultimately widely adopted and deployed.

AOI 4: Advanced Water Heating Technologies and Energy-Efficient Appliances

Participating Labs: LBNL, NREL, ORNL, PNNL
Estimated DOE Funding Available: $400,000–$1 million
Estimated Number of Projects: 1–4

Water heating accounts for approximately 19% of residential energy usage. Novel research and development opportunities along with market adoption of advanced water heating technologies that reduce energy consumption and greenhouse gas emissions, including heat pump water heaters, are a priority to reduce total building energy use.

AOI 5: Building Electric Appliances, Devices, and Systems (BEADS)

Participating Labs: All DOE national labs are eligible to participate
Estimated DOE Funding Available: Up to $1 million

Estimated Number of Projects: 1–2

AOI 5a. The New Standby: Addressing Rising Energy Consumption from Always-on Connected Devices
This topic is intended to demonstrate that the rise in standby consumption by IoT devices is not an inevitable consequence of their increased functionality. Manufacturers have generally not adopted low-power-operation wireless sensing systems nor low-power hardware, demonstrated in research settings, into commercially available IoT devices. Control strategies do not adequately incorporate connected MELs despite their intrinsic addressability, and predictive algorithms fail to delineate operational patterns between traditional MELs and IoT-MELs. Despite a host of communication and control features available to users of IoT devices, it remains uncommon for devices to report their own energy use.

Successful proposals will demonstrate one or more of the following: (1) the ability to reduce standby load for an IoT device at scale through the use of low-power hardware, current and current-leakage reduction, microcontroller optimization, or wake-up radio advances; (2) self-reporting capabilities that allow users, control systems, or load disaggregation devices to easily obtain power consumption data; (3) enabling features for improved controls and predictive algorithms targeted at IoT-MELs.

AOI 5b. Advancing Behind-the-Meter Hardware to Utilize Direct Current (DC) Power in Buildings
This topic aims to commercialize technologies that advance viability of DC power in buildings at the device or system level. A “chicken-egg” conundrum inhibits development and adoption of both native DC devices and infrastructure capable of supporting such devices. Appliance manufacturers do not typically engineer hardware capable of accepting DC voltage directly because buildings are generally not designed to provide it. On the other hand, building designers and specifiers do not plan for native DC devices that are not commercially available. Successful proposals will feature work with industry partners to develop hardware that works against this cycle, providing solutions with compelling value propositions beyond inherent efficiency improvements. Enabling hardware at the circuit-breaker level should be easily integrated with existing buildings, including DIN rail mounting and general familiarity to electrical installers. Outlet-level solutions and native DC devices should support the Universal Serial Bus (USB) 3.0 standard (or greater) and utilize USB-C connectors.

AOI 6: Scale-Up and Manufacturing of Emerging Building Technologies
Participating Labs: All DOE national labs are eligible to participate
Estimated DOE Funding Available: Up to $1 million
Estimated Number of Projects: 1–5

BTO is seeking proposals that aim to advance technologies beyond early-stage RD&D through proof-of-application, prototyping, pilot production, scale-up and/or manufacturing to successfully cross what is commonly called the “Commercialization Valley of Death.” The goal of the collaboration under this topic is to move early-stage RD&D concepts to commercially viable and market-available products.

Within this topic, BTO seeks proposals that pertain to BTO’s mission and that are not specifically identified elsewhere in this CRADA call. Technologies currently in the technology readiness level 5 to 8 range are generally sought under this topic. Activities may include but are not limited to technical assistance for prototyping, technology validation (in a lab or field setting), techno-economic analysis, and support for pilot production through scale-up and full-scale, cost-effective manufacturing.

DOE EERE FY21 BETO Scale-up and Conversion FOA; FOA # DE-FOA-0002396 [4.8.21]

FOA Issue Date: April 8, 2021
Submission Deadline for Concept Papers: April 30, 2021
Submission Deadline for Full Applications: June 21, 2021
Expected Date for EERE Selection Notifications: August 23, 2021

Number of Awards: 11 – 27
Available Funding: $61,380,000

Award Size per Project: $500,000 - $5,000,000
Period of Performance: 12 – 48 months
Prime Recipient Eligibility: For-profit entities; educational institutions; nonprofits incorporated under the laws of a particular state or territory of the United States and have a physical location for business operations in the United States; state, local, and tribal government entities; DOE/NNSA FFRDCs (prime for topic area 2 only)
Subrecipient Eligibility: For-profit entities; educational institutions; nonprofits; state, local, and tribal government entities; DOE/NNSA FFRDCs; non-DOE/NNSA FFRDCs; federal agencies and instrumentalities
Cost Share: 20% - 50% (see solicitation for details)

Background and Purpose
Building a clean and equitable energy economy and addressing the climate crisis is a top priority of the Biden Administration. This FOA will advance the Biden Administration's goals to achieve carbon pollution-free electricity sector by 2035 and to "deliver an equitable, clean energy future, and put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050." The Department of Energy (DOE) is committed to pushing the frontiers of science and engineering, catalyzing clean energy jobs through research, development, demonstration, and deployment (RDD&D), and ensuring environmental justice and inclusion of underserved communities.

In support of these Administration priorities, the Bioenergy Technologies Office (BETO) is focused on developing technologies that convert domestic biomass and other waste resources (e.g., municipal solid waste, biosolids) into low-carbon biofuels and bioproducts. These bioenergy technologies can enable a transition to a clean energy economy, create high-quality jobs, support rural economies, and spur innovation in renewable energy and chemicals production – the bioeconomy. The activities funded through this opportunity will mobilize public clean energy investment in the biofuels, chemical and agricultural industries, accelerate the deployment of bioenergy technologies, and support achieving economy-wide net-zero emissions by 2050.

This FOA supports high-impact technology RDD&D to accelerate the bioeconomy and, in particular, the production of low-carbon fuels for the aviation industry. BETO is focusing on applied RDD&D to improve the performance and reduce cost of biofuel production technologies and scale-up production systems in partnership with industry. By reducing cost and technical risk, BETO can help pave the way for industry to deploy commercial-scale integrated biorefineries and reduce greenhouse gas emissions from hard to decarbonize sectors, such as aviation. The Program is focused on developing and demonstrating technologies that are capable of producing low-carbon drop-in biofuels at $2.50 per gallon gasoline equivalent (GGE) by 2030, as well as associated renewable chemical co-products to achieve this target. BETO is focused on biofuel production pathways that can deliver at least 70% lower lifecycle greenhouse gas emissions than petroleum.

The research and development (R&D) activities to be funded under this FOA will support the government-wide approach to the climate crisis by driving the innovation that can lead to the deployment of clean energy technologies, which are critical for climate protection. Specifically, this FOA will support high-impact RDD&D focusing on the production of low-GHG fuels for the aviation industry, as well as the long-haul trucking and marine industries by soliciting proposals to scale-up technologies; cost effectively produce biomass derived sugars as an intermediate for the production of biofuels and bioproducts; and support cost effective separation technologies. In addition, the FOA will support increasing the efficiency of residential wood heaters and the production of renewable natural gas.

Topic Areas
Topic Area 1: Scale-up of Biotechnologies Overview
Significant progress has been made on biofuels through both government and private sector RD&D over the last 10 years and some technologies are now ready for scaling-up to support their ultimate commercialization. BETO recognizes the availability of financing for first-of-a-kind process systems can be a barrier to commercializing advanced biofuels. Pilot and demonstration scale facilities are key to ensuring that ultimately commercial biorefineries are successful. BETO is looking for bioenergy companies that are ready to move their technologies from the laboratory to the pilot and demonstration stage and eventual commercialization.

Based on lessons learned from previous pilot, demonstration, and pioneer integrated biorefineries, BETO's scale-up strategy will:

- allow projects to be funded at either the pre-pilot, pilot or demonstration scale.
- require projects have the data to show they have completed the previous stage successfully. This can be done through a previous BETO funded deployment or can be through one the company has done on its own.

- provide a consistent approach each year to provide industry with less uncertainty on BETO scale-up work.

This new strategy will include a multi-faceted approach in partnership with the private sector, the DOE national laboratories, and academia using the following elements:

- Focusing on the RDD&D of sustainable aviation fuels, while still recognizing the need to RDD&D of renewable diesel and sustainable marine fuels. A sustainable aviation fuel (SAF) is defined within the U.N. International Civil Aviation Organization as a renewable or waste derived aviation fuel that achieves net greenhouse gas emissions reductions and other sustainability criteria for aviation fuel on a life cycle basis;
- Allowing the use of waste resources as a low-cost feedstock including Municipal Solid Waste (MSW) and waste Carbon Dioxide (CO2), in addition to traditional agricultural and forestry wastes;
- Allowing bioproduct opportunities to enable biofuels development.
- Leveraging first-generation biorefinery infrastructure, supply chains, and resources to integrate technologies to produce fuels from grain starch.
- Leveraging other existing infrastructure from sister industries, including but not limited to petrochemical and pulp and paper;
- Leveraging US-produced, oilseed crops (see Appendix G) that meet all other metrics of the topic area, including achieving at least 70% GHG reductions;
- Development and use of predictive models and high performance computing as tools to lower risk and accelerate scale-up of biotechnologies; and
- Opportunities for pre-pilot, pilot, and demonstration scale projects.

The goal for this work is to help speed the uptake and commercialization of these technologies by the private sector.

Topic Area 2: Affordable, Clean Cellulosic Sugars for High Yield Conversion Overview

Biofuels produced from lignocellulosic biomass feedstocks can deliver significantly lower lifecycle greenhouse gas emissions than commercial starch-based sugars. However, it is much more challenging to produce an intermediate sugar from these feedstocks that is cheap enough and of sufficient quality to support a commercial conversion process. This topic area aims to lower the price of cellulosic sugars and de-risk their use by downstream partners through increased availability and performance. It is designed to attract companies that produce and seek to sell cellulosic sugars. These technologies could include a variety of low severity pretreatment processes, detoxification/impurity removal technologies, amongst others. The topic area also may include funding for downstream partners that are critical to evaluating the quality and convertibility of these sugars. The potential topic area seeks a variety of downstream upgrading approaches (biological, chemical, and electrochemical catalysis) to gain a diverse understanding of the quality of these substrates.

Topic Area 2 Specific Areas of Interest:

- Process intensification strategies for reducing the capital/operating expenses associated with pretreatment, enzymatic hydrolysis, and/or sugar conditioning/clarification
- Novel pretreatment processes for deconstructing and fractionating lignocellulosic feedstocks
- Novel processes for conditioning or detoxifying sugars to meet downstream quality and impurity specifications
- Optimization of pretreatment technologies/processes to improve product yields
- Processes that are capable of handling and producing sugars from multiple varieties of feedstocks

Topic Area 3: Separations to Enable Biomass Conversion

Separations are energy-intensive and critical to the economics of a bioprocess, and can account for up to 50% of the cost of producing biomass-based chemicals and fuels. Due to the cost and energy intensity, separations can have a large impact on improving economic viability and the lifecycle greenhouse gas benefits for biofuel production. In a biorefinery, bioprocess separations isolate a specific component from a complex mixture and are a critical part of a bioprocess and are often overlooked during technology development. New bioprocesses introduce many variables that may prevent existing separations technologies from being readily deployed. Therefore, co-development of separations with up- and down-stream processes is key to the success of the overall bioprocess.

WYOENERGY State of Wyoming Pilot Project: Design and/or Construction of a Pilot Project Demonstrating “Green” or “Blue” Hydrogen Production and Use [3.17.21]

FOA Issue Date: March 17, 2021
Proposal Closing Date: April 28, 2021
Final Project Selection: July 30, 2021

Award Size per Project: up to $1,000,000
Prime Recipient and Subrecipient Eligibility: Private industry, public and private universities, government agencies, research institutions, and individuals that can undertake a demonstration project of this magnitude
Cost Share: Project funding is limited and non-state matching funds are expected. Projects with higher matching amounts will be scored more favorably.

Research and Technology Topics, and Project Guidelines
The aim of this program is to assist the design and/or construction of a project demonstrating viability of hydrogen as a component of the Wyoming energy economy. As such, the project will leverage existing natural resources and infrastructure within Wyoming, test configurations of these resources and infrastructure in order to establish technical feasibility, and establish economic viability of the scenario as a whole. It is also anticipated that studies that test the viability or feasibility of a potential commercial project will be considered reasonable.

The technology platforms included in this announcement may include, but are not limited to, schemes that employ critical components in the following areas:

- Hydrogen from hydrocarbon feedstock with carbon capture and sequestration (blue hydrogen)
- Hydrogen production using renewable energy (green hydrogen)
- Upgrading of hydrogen to ammonia or other hydrogen based products such as synthetic methane, etc.
- Transportation of hydrogen
- Use of hydrogen as an energy carrier and storage mechanism
- Co-firing or other hydrogen utilization options

All projects should use a project management structure appropriate for the proposed work demonstrating a clear path to commercialization after completion of the project.

DOE EERE Industrial Assessment Centers; FOA # DE-FOA-0002452 [3.8.21]

FOA Issue Date: March 8, 2021
Submission Deadline for Letter of Intent: April 1, 2021
Submission Deadline for Full Applications: April 22, 2021
Expected Date for EERE Selection Notifications: June 8, 2021

Number of Awards: 25 – 35
Available Funding: $52,500,000
Award Size per Project: $1,500,000 - $2,250,000
Period of Performance: 60 months
Prime Recipient and Subrecipient Eligibility: U.S. college or school of engineering that is an integral part of its institutional structure that has at least one of its four-year undergraduate programs accredited by the ABET.
Cost Share: at least 20%

Purpose
This FOA seeks to train the future clean energy and manufacturing workforce by providing hands-on experience for engineering students who will conduct energy assessments at SMEs, often located in rural communities. The IAC

program advances the Biden Administration's plan to reach net-zero emissions no later than 2050 and ensure the communities who have suffered the most from pollution are first to benefit.

Topic Areas

Topic Area 1: Manufacturing Technical Assistance and Energy Engineering Workforce Development
The selected IACs will establish and operate centers physically located at their universities to provide resources to SMEs, critical suppliers and employers of Americans, including those located in disadvantaged communities. As semi-autonomous entities, the prospective IACs must demonstrate their capabilities to recruit and serve SMEs and describe their approach to identify and communicate recommendations to reduce energy, water usage and waste; increase productivity and competitiveness; identify opportunities for smart manufacturing, resiliency planning, decarbonization and electrification; and provide cyber security screenings. These recommendations need to be effectively reported to the SMEs, together with estimates of the energy and greenhouse gas emissions savings opportunities, implementation costs, and payback periods.

Topic Area 2: Commercial Building Efficiency Workforce Development Pilot Project [Optional Topic]
EERE's goal for this pilot project is to expand the workforce of building efficiency professionals with technical expertise on a range of topics including, but not limited to: space heating and cooling, ventilation, water heating, lighting, cooking, refrigeration and plug and process loads associated with equipment. Specialized curricula – supplemented with an existing credentialing program within EERE's Buildings Technologies Office (i.e., the Better Buildings Workforce Guidelines for building energy auditor and building commissioning professional (https://www.nibs.org/page/cwcc_resources)) – will form the basis for training offered through these partnerships.

While IAC personnel are qualified to perform these activities, DOE seeks to launch a pilot project to expand workforce development programs and to create opportunities for more diverse applicants and students to work within the commercial building market. DOE prefers applications that include technical training provided via partnerships between IACs and community colleges or technical programs (i.e., other educational/vocational entities providing relevant technical content).

Like their IAC student counterparts, building efficiency students and professionals receiving training from community college and technical program partners would benefit from hands-on experience. As part of the pilot, IAC personnel – including experienced students – could work with community colleges and technical programs to train and provide continuous learning for students and professionals in conducting assessments of existing small to medium-sized commercial and other buildings – defined as being less than 100,000 square feet – including those located in disadvantaged communities and to identify and provide on-the-spot efficiency improvements. Logistics for planning and tracking the results of these assessments would fall to the IACs, although the assessments would be conducted by the building efficiency students/professionals, and the assessment teams would be much smaller – perhaps only one or two individuals per assessment. Similarly, individual building reports would be more limited in scope than the typical IAC report and would take less time to complete.

DOE SC BES Materials and Chemical Sciences Research for Direct Air Capture of Carbon Dioxide; FOA # DE-FOA-0002481 [3.5.21]

FOA Issue Date: March 5, 2021
Submission Deadline for Pre-Applications: March 30, 2021
Submission Deadline for Applications: May 18, 2021

Available Funding: Up to $24 million
Award Size per Project: $200,000 - $1,200,000
Period of Performance: 3 years
Prime Recipient Eligibility: Domestic applicants, DOE/NNSA National Laboratories
Subrecipient Eligibility: Domestic applicants, DOE/NNSA National Laboratories, Non-DOE/NNSA FFRDCs, other Federal Agencies
Cost Share: none required

Summary

The DOE SC program in Basic Energy Sciences (BES) announces its interest in receiving applications from single investigators and from teams for support of experimental and theoretical efforts to advance fundamental understanding of the capture of carbon dioxide (CO2) from dilute sources including combined capture and chemical conversion of CO2. Although direct air capture of carbon dioxide (DAC) generally refers to the capture of CO2 from ambient air, this FOA also considers the removal of CO2 from partially concentrated air (e.g., building HVAC exhaust) and from natural fluids (e.g., the ocean and surface waters) that received their CO2 directly from ambient air. Enhanced understanding of scientific phenomena and approaches for DAC would accelerate progress and strengthen the foundation for applications that deliver economic benefit and/or energy security.

BES seeks innovative fundamental research in three topical areas:

1) Novel **Energy Transfer Mechanisms** for Regeneration of and Mass Transport in Direct Air Capture Systems;
2) Understanding **Temporal Changes** That Occur during Separations; and
3) **Science Driven Synthesis and Assembly** of Innovative Materials for Direct Air Capture.

DOC EDA 2021 Build to Scale Program; Solicitation # EDA-HDQ-OIE-2021-2006827 [2.23.21]

Posted Date: February 23, 2021
Submission Deadline for Full Applications: April 29, 2021
Expected Date for Selection Notifications: June 28, 2021 – July 28, 2021

Available Funding: $38 million
Award Size per Project: up to $1.5 million
Period of Performance: 3 years
Prime Recipient Eligibility: state, Indian tribe, city or other political subdivision of a state
Subrecipient Eligibility: state, Indian tribe, city or other political subdivision of a state, nonprofit organization, institution of higher education, public-private partnership, science or research park, Federal laboratory, venture development organization, economic development organization or similar entity
Cost Share: 50%

Funding Opportunity Description
EDA's Office of Innovation & Entrepreneurship is committed to furthering tech-based economic development initiatives that accelerate high quality job growth, create more economic opportunities, and support the future of the next generation of industry leading companies. Funding is available for organizations that aid companies in developing the next generation of technologies. Under the Build to Scale Program, EDA is soliciting applications for two separate competitions:

- the 2021 Venture Challenge and
- the 2021 Capital Challenge.

I. Venture Challenge
The Venture Challenge invites organizations to submit competitive proposals that seek to support entrepreneurship and accelerate company growth in their community, region, or combination of regions. Competitive proposals will outline how the project will strengthen economic competitiveness through new product innovation or new technology adoption, enhancing research commercialization processes and outcomes, remediating structural barriers that inhibit regional innovation capacity and resilience, and/or leveraging regional competitive strengths to stimulate innovation and job creation. Companies served by the applicant organization should be challenging the status quo of established markets, commercializing technologies, and furthering job creation within their businesses. Applicants should provide evidence that illustrates how funds leveraged through this competition will not only launch new programming and/or scale existing programming, but also generate sustainable added value for the region's entrepreneurial ecosystem by augmenting existing regional assets for innovation and entrepreneurship.

The Venture Challenge is a single competition but is comprised of two funding levels: Build and Scale. Venture Challenge Build applicants may not request in excess of $750,000 over the three-year period of performance. Venture Challenge Scale applicants must request more than $750,000 and may not request in excess of $1,500,000 over the three-year period of performance.

Venture Challenge Build applicants:

- May be piloting a solution to a demonstrated need
- May be implementing a proven solution for a new region or community
- Demonstrate a commitment and ability to collect agreed upon impacts
- Request may not exceed $750,000 over a 3-year project period
- Provide a 1:1 match

Venture Challenge Scale applicants:

- May be scaling an existing initiative that has established and achieved impacts
- Have a proven track record of successful deployment of programs
- Demonstrate a commitment and ability to collect agreed upon impacts
- Request must be greater than $750,000 and may not exceed $1,500,000 over a 3-year project period
- Provide a 1:1 match

Examples: Organizations interested in applying to the Venture Challenge are encouraged to review project profiles of past awardees of the 2020 Venture Challenge or i6 Challenge (the predecessor to the Venture Challenge), at https://www.eda.gov/oie/historical/.

II. Capital Challenge

The Capital Challenge provides operational support for the formation, launch, or scale of investment funds that seek to invest their capital in scalable startups (i.e., venture funds, seed funds, angel funds) or to organizations with a goal to expand capital deployment within a community, region, or regional industry (i.e., angel networks or investor training programs). Funding will primarily support operational and programmatic costs and may not be used as investment capital.

Capital Challenge applicants should:

- Practice equity-based investing, whether through traditional or hybrid models, or be supporting an initiative whose participants practice equity-based investing (in contrast to debt-based investing, which is not supported under the Capital Challenge)
- Evaluate companies for high-growth potential as a central factor of their investment strategy
- Utilize grant funds to catalyze the deployment of capital within their region and/or related regions
- Demonstrate a commitment and ability to collect agreed upon impacts
- Request may not exceed $400,000 over a 3-year project period
- Provide a 1:1 match

Examples: Organizations interested in applying to the Capital Challenge are encouraged to review project profiles of past awardees of the 2020 Capital Challenge or Seed Fund Support competition (the predecessor to the Capital Challenge), at https://www.eda.gov/oie/historical/.

DOE ARPA-E OPEN 2021; FOA # DE-FOA-0002459 [2.11.21]

FOA Issue Date: February 11, 2021
Submission Deadline for Concept Papers: April 6, 2021
Submission Deadline for Full Applications: TBD
Expected Date for Selection Notifications: TBD

Available Funding: approximately $100,000,000
Award Size per Project: $250,000 - $10,000,000
Period of Performance: up to 3 years
Eligibility: U.S. universities, national laboratories, industry, and individuals are eligible to apply as a prime recipient or subrecipient.
Cost Share: base cost share is 20% (many exclusions apply, see solicitation)

Program Overview

This FOA marks the fifth OPEN solicitation in the history of ARPA-E. The previous OPEN solicitations were conducted at the inception of the agency in 2009 and again in 2012, 2015, and 2018. OPEN 2021 therefore continues the three-year periodic cycle for ARPA-E OPEN solicitations. An OPEN solicitation provides a vitally important mechanism for the

support of innovative energy R&D that complements ARPA-E's primary mechanism, which is through the solicitation of research projects in focused technology programs.

ARPA-E's focused programs target specific areas of technology that the agency has identified, through extensive interaction with the appropriate external stakeholders, as having significant potential impact on one or more of the Mission Areas described in Section I.A of the FOA. Awards made in response to the solicitation for focused programs support the aggressive technical targets established in that solicitation. Taken in total, ARPA-E's focused technology programs cover a significant portion of the spectrum of energy technologies and applications.

ARPA-E's OPEN FOAs ensure that the agency does not miss opportunities to support innovative energy R&D that falls outside of the topics of the focused technology programs or that develop after focused solicitations have closed. OPEN FOAs provide the agency with a broad sampling of new and emerging opportunities across the complete spectrum of energy applications and allow the agency to "take the pulse" of the energy R&D community. OPEN FOAs have been and will continue to be the complement to the agency's focused technology programs – a unique combination of approaches for supporting the most innovative and current energy technology R&D. For instance, one-third of the sixty examples of most successful ARPA-E projects featured in ARPA-E Impact volumes (https://arpa-e.energy.gov/about/our-impact) resulted from OPEN solicitations. Potential applicants to this FOA are strongly encouraged to examine the OPEN projects in these volumes and all of the projects supported in the previous four OPEN solicitations (https://arpa-e.energy.gov/technologies/open-programs) for examples of the creative and innovative R&D ARPA-E seeks in its OPEN solicitations.

Program Objectives

The objective of an ARPA-E OPEN FOA is simple, yet comprehensive: to support high-risk R&D leading to the development of potentially disruptive new technologies across the full spectrum of energy applications. ARPA-E seeks to support early-stage, but potentially transformational research, in all areas of energy R&D, covering transportation and stationary applications. Areas of research responsive to this FOA include (but are not limited to) electricity generation by both conventional and renewable means; electricity transmission, storage, and distribution; energy efficiency for buildings, manufacturing and commerce, and personal use; and all aspects of transportation, including the production and distribution of both renewable and non-renewable fuels, electrification, and energy efficiency in transportation.

Because of the enormous breadth of energy technologies solicited under an OPEN FOA, the well-defined technical targets in a focused ARPA-E technology program FOA are inapplicable. Rather, ARPA-E asks applicants to address the potential impact of the proposed technology on the agency's Mission Areas: reducing imported energy, reducing energy-related emissions, and improving energy efficiency. The critical question for applicants to consider in assessing potential impact is: "If it works, will it matter?" In a FOA for a focused technology program, this question has already been answered by ARPA-E. If an applicant can demonstrate that the proposed technology can achieve the challenging technical targets specified in the FOA for a focused program, the agency believes that the technology can have significant impact on the agency's missions. In an OPEN FOA, the burden of demonstrating potential impact lies solely upon the applicant, who must make the strongest possible case for why the proposed technology will matter – that it has the potential to change our energy future.

Technical Categories of Interest

Category 1: Grid	Subcategory A: Grid Transmission	Technologies for the electricity transmission system (>69 kV) planning and operations, including both AC and DC systems.
	Subcategory B: Grid Distribution	Technologies for the electricity distribution system (<69 kV) planning and operations including both AC and DC systems.
	Subcategory C: Modeling, Software, Algorithms, And Control For The Grid	Modeling, algorithms, or control methodologies that improve grid planning, operations, or markets.
	Subcategory D: Batteries – Grid Scale	Grid scale battery technologies.
	Subcategory E: Grid Scale (Non-Battery) Storage	Non-battery technologies for grid-scale storage such as: pumped-hydro, compressed air, high angular velocity flywheels, etc.
	Subcategory F: Grid Reliability	Technologies that maintain the efficient function of the grid during unusual events, particularly in the context of increasing renewable energy sources and/or distributed generation.

	Subcategory G: Grid – Other	Grid technologies that do not fit into one of the above categories.
Category 2: Transportation	Subcategory A: Alternative Fuels (Non-Bio)	Technologies that create fuels that are substitutes for gasoline/diesel, but are not bio based.
	Subcategory B: Engines – Transportation	Technologies for improved internal combustion engines and other engine types (e.g., turbines) specifically for transportation applications.
	Subcategory C: Electric Motors – Transportation	Technologies for improved electric motors specifically for transportation applications.
	Subcategory D: Fuel Cells - Transportation	Technologies for improved fuel cells specifically for transportation applications.
	Subcategory E: Advanced Vehicle Designs and Materials	Advanced or alternative vehicle designs and/or key enabling technologies. Examples could include ultralightweight vehicles, advanced components, new vehicle designs and architectures, etc.
	Subcategory F: Transportation Management	Technologies for traffic management, transportation behavior, self-driving cars and other advanced transportation management scenarios.
	Subcategory G: Power Electronics – Transportation	Technologies that include advances in semiconductor materials, substrates, circuit topologies, magnetic materials, inductors, dielectric materials, capacitors, transistors, device packaging, etc. or optimizations of electronic systems applied specifically to transportation applications.
	Subcategory H: Non-Automotive Ground/Sea Transportation	Technologies for advanced human powered vehicles, marine vessels, trains, etc.
	Subcategory I: Air Transportation	Technologies for advanced airplanes.
	Subcategory J: Batteries – Transportation	Technologies for improved batteries for a wide range of vehicle applications, including hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and battery electric vehicles (EVs).
	Subcategory K: Non-Battery Storage For Transportation	Technologies that apply thermal storage, and non-battery electric storage, such as supercapacitors and others specifically for transportation application.
	Subcategory L: Transportation – Other	Transportation energy technologies that do not fit one of the above categories.
Category 3: Building Efficiency	Subcategory A: Combined Heat and Power	Technologies for new Combined Heat and Power (CHP) designs/scenarios.
	Subcategory B: Building Heating and Cooling	Technologies that improve the efficiency of building heating and cooling systems.
	Subcategory C: Building Energy Demand Management	Demand response and/or management technologies such as smart meters, other building energy conservation technologies such as automatic control systems.
	Subcategory D: Lighting	Energy efficient and environmentally-friendly advanced lighting technologies.
	Subcategory E: Building Envelope	Building designs leading to better energy efficiency; technologies that could be applied to windows, insulation, roofing, etc.
	Subcategory F: Building Efficiency – Other	Building energy efficiency technologies that do not fit into one of the categories above.
Category 4: Power Generation and Energy Production: Fossil/Nuclear	Subcategory A: Combined Processes – Generation with Fossil Fuels	Improved generation designs which use a combination of technologies (for example- fuel cells and turbines) with fossil fuels.
	Subcategory B: Stationary Engines/Turbines For Generation with Fossil Fuels	Improved engines/turbines for generation applications using fossil fuels.
	Subcategory C: Stationary Fuel Cells For Generation with Fossil Fuels	Improved fuel cells intended to be coupled with generation sources using fossil fuels.

	Subcategory D: Nuclear Fission Power Generation and Materials	Technologies that enhance fission, or materials specifically for safe nuclear fission power generation.
	Subcategory E: Nuclear Fusion Power Generation and Materials	Technologies that enhance fusion, or materials specifically for safe nuclear fusion power generation.
	Subcategory F: Carbon Capture	Technologies for carbon capture, use, and storage, excluding biological/agricultural carbon management.
	Subcategory G: Exploration And Extraction (Non-Geothermal) Of Conventional and Unconventional Fossil Resources	Technologies/tools for resource identification, classification, and modeling, as well as technologies to extract conventional and unconventional fossil resources. This subcategory can include sensors and imaging technologies, predictive models and algorithms, drills, pumps, etc.
	Subcategory H: Planning And Operations For Generation with Fossil Fuels	Technologies that improve the planning and operation of power generation with fossil fuels.
	Subcategory I: Infrastructure for Combustible Gas	Technologies for storage, transportation, handling, and/or monitoring of combustible gases. This could include tanks, pipelines, pumps, sensors, etc.
	Subcategory J: Chemical and Biological Conversions From Fossil Fuels	Technologies that improve chemical or biological conversions of fossil resources such as gas to liquids (GTL), coal to liquids (CTL), and other forms of energy transduction, including downstream production of commodity chemicals.
	Subcategory J: Water Conservation In Power Generation	Technologies that will enable significant water savings in the generation of power, such as water recovery/recirculation systems or dry cooling of power plants.
	Subcategory K: Generation with Fossil Fuels – Other	Generation technologies that do not fit into one of the categories above.
Category 5: Power Generation: Renewable	Subcategory A: Wind – Energy Capture	Technologies that lead to better capture of wind resources. This could include different configurations, blade designs and materials. Also in this category could be tools for wind resource identification, classification, and modeling.
	Subcategory B: Wind – Energy Conversion	Technologies that lead to better conversion of wind power into useable energy, such as generators and magnetic materials, electronics, etc. specifically designed for wind energy.
	Subcategory C: Geothermal Energy	Geothermal heat technologies including pumps, proppants, induced seismicity, enhanced geothermal systems (EGS), drilling, resource identification (sensors, models, tracers), zonal isolation techniques, robust equipment, low temperature generation, etc.
	Subcategory D: Hydro Energy	Technologies for capturing and/or converting hydrokinetic energy such as ocean, osmotic, tidal, etc., Technologies for hydro resource identification and modeling.
	Subcategory E: Solar – PV/CPV	Technologies for solar PV/CPV systems including materials, cell configurations, optical solar concentrators, BOS and other technologies for solar cells that convert light into electricity or fuel. Technologies to enable for cheaper installation or solar PV resource identification and modeling.
	Subcategory F: Solar – Non-PV	Technologies for non-PV conversion of solar energy including solar thermal conversion (materials, configurations, concentrators, and BOS), direct conversion of solar energy to fuels through thermal or catalytic routes, and other technologies that use or convert solar energy without PV conversion.
	Subcategory G: Power Electronics – Renewable Generation	Technologies that include advances in semiconductor materials, substrates, circuit topologies, magnetic materials, inductors,

		dielectric materials, capacitors, transistors, device packaging, etc. applied to renewable power generation.
	Subcategory H: Renewable Power – Other	Renewable energy technologies that do not fit one of the above categories.
Category 6: Bioenergy	Subcategory A: Biomass Production	Technologies that improve biomass characteristics, such as yield and sustainability, and decrease cost of production and/or water use.
	Subcategory B: Biofuel Production – Biological Methods	Technologies that utilize a biological agent in one or more principal step(s) of feedstock conversion to fuels.
	Subcategory C: Biofuel Production – Nonbiological Methods	Technologies that do not utilize any biological agent in the conversion of organic feedstock to fuels, such as thermochemical and hybrid approaches or biomimetics.
	Subcategory D: Bioenergy Supply Chain	Technologies critical to supply chain development, such as feedstock collection and handling.
	Subcategory E: Bioenergy – Other	Technologies for bioenergy which do not fit in one of the above subcategories. Including but not limited to bioreactors, balance of plant, bioproducts, microbial fuel cells, sensors, and biological or agricultural carbon management.
Category 7: Other Energy Technologies	Subcategory A: Water Production/Reuse	Technologies that enable cost-effective and energy efficient ways of providing fresh water.
	Subcategory B: Thermal Energy Storage	Thermal energy storage technologies that can apply to multiple applications.
	Subcategory C: Advanced Manufacturing	Technologies that enable energy-efficient manufacturing capabilities or methods or that use advanced manufacturing to enable new energy technologies.
	Subcategory D: Appliance And Consumer Electronics Efficiency (End Use)	Technologies that improve the energy efficiency of appliances and consumer electronics, including but not limited to: refrigerators, washers, dryers, televisions, stoves, personal computers, phones, etc.
	Subcategory E: Data Centers and Computation	Technologies to improve the energy efficiency of large-scale computers, data centers, and computational infrastructure.
	Subcategory F: Industrial Efficiency – Materials	Technologies that improve the energy efficiency of or reduce emissions from producing industrial materials, including but not limited to glass, paper, iron, steel, plastics, aluminum, cement, etc.
	Subcategory G: Industrial Efficiency – Other	Technologies that improve the energy efficiency of industrial processes which are not covered by other subcategories.
	Subcategory H: Heat Recovery	Technologies for heat recovery including but not limited to thermoelectrics, Stirling engines, heat exchangers, conversion of waste heat, bottoming cycles, heat capture methods, materials, devices, etc.
	Subcategory I: High Temperature Materials	Materials designed specifically to withstand extremely high temperatures in order to enable new energy generation technologies.
	Subcategory J: Semiconductors	Technologies that enable the development of new semiconductor materials or the use of semiconductor materials in innovative applications.
	Subcategory K: Portable Power	Technologies for portable power applications such as piezoelectrics, portable fuel cells, batteries, etc.
	Subcategory L: Other Energy Technologies Not Listed Above	

DOE SC BES Chemical Upcycling of Polymers; FOA # DE-FOA-0002462 [2.4.21]

FOA Issue Date: February 4, 2021
Submission Deadline for Pre-Applications: March 10, 2021
Submission Deadline for Applications: May 12, 2021

Available Funding: Up to $25 million
Award Size per Project: $200,000 - $1,500,000
Period of Performance: 3 years
Prime Recipient Eligibility: Domestic applicants, DOE/NNSA National Laboratories
Subrecipient Eligibility: Domestic applicants, DOE/NNSA National Laboratories, Non-DOE/NNSA FFRDCs, other Federal Agencies
Cost Share: none required

Summary
The DOE SC program in Basic Energy Sciences (BES) announces its interest in receiving applications on behalf of single investigators and teams of investigators, which may involve multiple institutions, to support fundamental experimental and theoretical efforts that advance chemical upcycling of polymers and circular design of next generation plastics. The term “plastic” describes a wide array of polymeric materials with diverse compositions and properties. Finished plastic products may include multiple polymeric components and often contain additives to obtain desirable physical, chemical, or mechanical properties. Understanding of chemical approaches that make use of end-of-life plastic products as feedstocks to regenerate the same product, or otherwise upcycle them to new, more valuable products, is limited. BES seeks innovative fundamental research that creates the scientific foundations for new technology solutions to reduce plastic waste, lower the energy impacts of plastic production through chemical upcycling, and create energy- and carbon-efficient feedstocks for valuable products through chemical upcycling of polymers.

Topic Areas
This FOA emphasizes cross-cutting, fundamental research in the following areas:

- Discovery and design of new chemical pathways to deconstruct synthetic polymeric materials efficiently and selectively into useful chemical intermediates or to functionalize existing polymers to provide new, materials with improved properties.
- Detailed molecular-level mechanistic understanding of macromolecular conversions of polymers to materials or chemical intermediates for upcycled products from plastics, such as deconstruction and reassembly of polymers, controlled functionalization of single polymers feeds or selective reaction of single polymer classes in mixed plastic streams, compatibilization of mixed polymers, and similar chemical transformations leading to upcycled products.
- Co-design of materials and chemical processes, coupling aspects of plastics construction, use, disassembly, and reassembly to maximize energy efficiency. This includes design and synthesis of new polymers for materials with similar or improved properties relative to current plastics that can be upcycled either in closed loops (recreating the starting material) or in cascades of processes producing series of different products that significantly extend the useful lifetime of the carbon building blocks of polymers.
- Novel approaches for efficiently delivering the energy required to drive specific chemical transformations and enable both energy- and carbon-efficient plastics upcycling. This may include strategies that use electro-, photo-, and photo(electro)chemical approaches, or that couple these inputs to thermal processes.
- Development of next-generation tools to probe macromolecular transformations and/or to understand polymer-catalyst interactions and behavior that drive conversion and selectivity during upcycling processes. This includes experimental, computational, and data science approaches, and their integration, to gain insights into mechanisms of materials and macromolecular transformations.

ARC POWER Initiative 2021 RFP Overview [1.14.21]

RFP Release Date: January 14, 2021
Letter of Intent due date: March 5, 2021

Proposal due date: April 16, 2021

Award Size per Project: $400,000 - $1,500,000
Period of Performance: 12 months – 36 months
Prime Recipient and Subrecipient Eligibility: Local development districts, Indian tribes, states, counties, cities, institutions of higher education, public or private nonprofit organizations
Cost Share: varies, see solicitation

Power Initiative
The Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative makes available federal resources to help communities and regions affected by job losses in coal mining, coal power plant operations, and coal-related supply chain or logistics industries due to the changing economics of America's energy production and the coal economy. POWER supports efforts to create a more vibrant economic future for coal-impacted communities by cultivating economic diversity, enhancing job training and reemployment opportunities, creating jobs in existing or new industries, and attracting new sources of investment. For coal-impacted communities to diversify their local and regional economies successfully, POWER prioritizes targeting federal resources to projects and activities with the following characteristics:

- Will produce diverse economic development outcomes, such as the following:
    - Diversify the commercial and industrial bases of local and regional economies
    - Create high-quality, well-paying jobs in new and/or existing industries
    - Attract new sources of public and private investment
    - Provide a range of workforce services and skills training, including paid work-based learning opportunities, resulting in industry-recognized credentials for high-quality, in-demand jobs
- Are specifically identified under state, local, and/or regional economic development plans
- Have been collaboratively designed by a diverse blend of state, local, and regional stakeholders

The POWER Initiative seeks to align and leverage complementary federal, state, and other economic development resources that provide assistance through competitively awarded grants to partnerships anchored in coal-impacted communities. By aligning and leveraging multiple resources (federal, state, local, non-profit, and private sector), POWER solicits and prioritizes the selection of projects that integrate multiple economic development systems and resources in support of implementing existing economic development strategic plans.

Project proposals that do not fit the following list of POWER investment priorities may be considered for funding, but all applications will be reviewed on their ability to address at least one of these priority areas.

1. Building a Competitive Workforce
    - Projects investing in workforce training should stress the potential for **upward mobility** for the participants. This can be accomplished through upskilling, retooling, and establishing clear, defined career pathways in training programs that accommodate continued growth.
    - Workforce projects should aim to **increase labor participation rates** by not only targeting underemployed workers, but recruiting and training people who have dropped out of the workforce.
    - Proposals for training programs should be supported with evidence that indicates a demand for that particular skillset in the area to be served. Evidence can include letters from local businesses and business groups expressing a need or analyses of local and regional labor markets.
2. Fostering Entrepreneurial Activities
    - **Access to capital.** ARC seeks to increase private investment capital available to small and medium-sized businesses across the Region through the POWER program. ARC supports the formation, operation, and capitalization of a range of development finance activities. ARC encourages investment made with the intent of generating measurable social or environmental returns and a financial return (also known as impact investing).
        - All access-to-capital projects must supply additional information as outlined in Appendix A.
    - **Creation, support, and growth of entrepreneurial ecosystems.** ARC research has identified several key components of strong entrepreneurial ecosystems: market access, capital, talent, business assistance, infrastructure, and culture/community leadership. Projects should target and strengthen multiple components in a region. ARC's research can be found at www.arc.gov/ecosystems.

- **Development and deployment of entrepreneurship education programs** that seek to lay the groundwork for a shift in a region's entrepreneurial culture, especially those that work in concert with science, technology, engineering, and math (STEM) initiatives.
- **Invest in a region's natural and cultural assets** and creative enterprises through activities that increase entrepreneurship. Project activities in this area should be integral to a region's overall economic development strategy and result in realistic, measurable economic benefits.

3. Developing Industry Clusters in Communities
    - **Supporting small manufacturing companies for product and market diversification and expansion.** Project activities in this area should be designed to help communities cultivate an environment where new and existing manufacturers create well-paying jobs through increased private investment and acceleration of the resurgence of manufacturing. Examples include but are not limited to supply chain improvements, bringing connectivity and interoperability to the manufacturing facility, export assistance, energy efficiency improvements, and improved access to capital for the Region's small and mid-sized manufacturers.
    - Bolstering entrepreneurial, technical, academic, and scientific talent that **support the creation of strategic industry clusters**, such as food systems or high-tech manufacturing, which yield high-quality businesses and jobs.
4. Strengthening Substance Abuse Response
    - Projects that address the substance abuse crisis should focus on creating a **recovery ecosystem** that will lead to **workforce re-entry**. Projects are encouraged to support the **post-treatment to employment continuum**, which could include investments in healthcare networks that support substance abuse recovery professionals, recovery-focused job training programs, as well as initiatives designed to coordinate, or link, recovery services and training that support the recovery ecosystem.
        - The **recovery ecosystem**, within the context of building and strengthening economically resilient communities in Appalachia, is a complex linkage of multiple sectors (including but not limited to recovery communities, peer support, health, human services, faith communities, criminal justice, public safety, housing, transportation, education, and employers) designed to help individuals in recovery access the support services and training they need to maintain recovery and successfully obtain sustainable employment.
    - Initiate or expand programs designed to eliminate or reduce the harm to the workforce and economic growth of the Region that results from such abuse; attract and retain relevant health care services, businesses, and workers.
5. Broadband
    - Up to one-third of funds provided for the POWER FY21 program will be available to fund broadband deployment projects that enhance access to broadband service. Broadband is a critical infrastructure component needed by all segments of the community: for business development; job creation; health care services, including telemedicine; and to help rural areas compete with more densely populated areas.
    - Understanding that broadband deployment projects can be capital intensive, grant requests for deployment projects can be up to $2.5 million, with priority given to projects with evidence of leveraged funding for the overall project. **To qualify for broadband deployment funding, at least 65% of the project's budget must be directed to the actual deployment of broadband infrastructure. Projects whose budgets direct more than 35% of their funds toward activities not directly associated with deployment of broadband infrastructure will follow the same guidelines as implementation projects and will not qualify for broadband deployment funding.**
    - Broadband applicants must provide additional information as outlined in the application and within the RFP (Appendix B).

DOE EERE Hydrogen and Fuel Cells R&D 2021; FOA # DE-FOA-0002446 [12.10.20]

FOA Issue Date: December 10, 2020
Submission Deadline for Concept Papers: January 15, 2021
Submission Deadline for Full Applications: March 8, 2021
Expected Date for EERE Selection Notifications: May 2021
Expected Timeframe for Award Negotiations: May 2021 – August 2021

Anticipated Awards: 4 – 8
Available Funding: $8 million
Award Size per Project: $1 million - $2 million
Period of Performance: 3 years
Prime Recipient Eligibility: for-profit entities; educational institutions; nonprofits; state, local, and tribal governments
Subrecipient Eligibility: all that are qualified to be a prime recipient, DOE/NNSA FFRDCs, and non-DOE/NNSA FFRDCs
Cost Share: 20%

Background and Purpose
Hydrogen and fuel cells represent a growing industry with potential to enable energy resiliency, energy security, emission reductions and economic growth. In recent years, the industry has delivered thousands of fuel cells across the U.S. for use in limited stationary and transportation applications; today, an expansion to heavy-duty applications is taking shape, with potential new hydrogen-use markets including trucks, marine vessels, rail, data centers, and the expanded industrial use of hydrogen in chemicals synthesis, metals refining, energy storage and grid integration.

This FOA supports research and development (R&D) to enable "H2@Scale" a DOE initiative to achieve large scale production, storage, transport, and utilization of hydrogen across multiple sectors. Supporting EERE's core priorities of energy affordability, integration and storage, H2@Scale research, development and demonstration (RD&D) aims to advance the adoption of hydrogen and fuel cell technologies in integrated energy systems across key applications that provide a value proposition as well as reduce emissions. However, a number of challenges remain including cost, performance, durability, manufacturing and scale-up issues, and developing integrated systems that demonstrate the unique technical, economic and environmental benefits of hydrogen and fuel cells.

To address these challenges, HFTO supports a comprehensive RD&D portfolio addressing materials-, component- and systems-level R&D on hydrogen and fuel cell technologies (e.g., MW-scale electrolyzers, fuel cells for heavy-duty transportation applications, hydrogen delivery and fueling infrastructure, among others); and technology acceleration efforts addressing first-of-a-kind demonstration of integrated energy systems, as well as manufacturing innovations and safety codes and standards. HFTO RD&D relies heavily on collaborations among various industry and university stakeholders and the national laboratories, including through HFTO-managed consortia.

This year, HFTO launched two major collaborative research initiatives leveraging world-class expertise and state-of-the-art equipment at the national laboratories: the Million Mile Fuel Cell Truck (M2FCT) consortium and the H2NEW consortium. Under each consortium, DOE national laboratories are working together in cutting-edge R&D and collaborating with the hydrogen and fuel cell communities to identify innovative ways to make hydrogen and fuel cell technologies more affordable and competitive in today's market. Each consortium is planned at $50 million over five years, along with a similar level for industry and university FOAs, to advance progress in specific hydrogen production and fuel cell RD&D areas:

- M2FCT includes Los Alamos and Lawrence Berkeley National Laboratories as co-leads, and focuses on fuel cell durability, performance, and cost to better position fuel cell trucks as a viable option in the long-haul trucking market.
- H2NEW includes National Renewable Energy Laboratory and Idaho National Laboratory as co-leads, and focuses on R&D to enable affordable, durable and efficient large-scale electrolyzers, which produce hydrogen from electricity and water (at both high and low temperatures).

This HFTO FY21 RD&D FOA will provide more than $33,500,000 in Federal funding for topics designed to supplement the current HFTO RD&D portfolio in the advancement of hydrogen and fuel cell technologies, with an emphasis on incentivizing collaborative progress among industry, university and national laboratory stakeholders, including coordination with the M2FCT and H2NEW Consortia. This FOA includes the following four areas of R&D:

1) Fuel Cell R&D for Heavy-Duty Applications
This topic includes two focus areas to reduce the cost and enhance the durability and performance of Polymer Electrolyte Membrane (PEM) fuel cell stacks for heavy-duty applications. Efforts in both areas are to be coordinated with the Million Mile Fuel Cell Truck consortium. The first research area supports development of bipolar plates with a focus on innovative, low-cost materials with high corrosion resistance and minimal degradation. The second research area is focused on the development of air management components and subsystems for improved reliability and lower overall heavy duty fuel cell system costs.

2) Efficient and Innovative Hydrogen Production
This topic includes two focus areas aimed at developing sustainable generation technologies to enable low-cost production of clean hydrogen at large scale. The first area, carried out in collaboration with DOE's Advanced Manufacturing Office (AMO), focuses on increasing the production volume of advanced components, stacks, sub-systems, and systems for multi-MW-scale high-temperature electrolyzers to lower hydrogen production costs. This would be coordinated with the H2NEW consortium. The second focus area supports technology development which enables low cost hydrogen production via waste and biomass conversion. Research approaches in this area include microbial conversion technologies viable at large or distributed/community scales, with development of novel systems to bring down cost, improve yield, and enable scale-up.

3) High-flow Fueling Applications
This topic includes two focus areas for development of novel hydrogen fueling technologies and processes that can increase hydrogen dispensing rates to facilitate rapid fueling of heavy-duty vehicles. The first focus area supports low-cost, reliable, domestically supplied hydrogen fueling station components to enable high-flow hydrogen fueling of heavy-duty trucks. The second focus area supports R&D necessary to develop a high-flow gaseous fueling model and ultimately a standard protocol which can achieve targeted fill rates.

4) Cost Analysis for Fuel Cells, Hydrogen Production, and Hydrogen Storage
This topic includes three focus areas for the development of a comprehensive set of cost analyses involving all aspects of hydrogen and fuel cell technologies. Projects would define the current state-of-the-art in key areas, develop and refine system configurations and designs, provide guidance on R&D gaps, and help to direct future R&D priorities in fuel cell, hydrogen production, and hydrogen storage technologies.

DOE EERE Vehicle Technologies Office Fiscal Year 2021 Research; FOA # DE-FOA-0002420 [12.10.20]

FOA Issue Date: December 10, 2020
Submission Deadline for Concept Papers: February 5, 2021
Submission Deadline for Full Applications: March 3, 2021
Expected Timeframe for EERE Selection Notifications: July 2021
Expected Timeframe for Award Negotiations: July 2021 – September 2021

Anticipated Awards: 20 – 32
Available Funding: $60.2 million
Award Size Per Project: $300k – $5.75 million
Period of Performance: 27 – 39 months

Background and Purpose
Vehicles move our national economy. Annually, vehicles transport 11 billion tons of freight – more than $35 billion worth of goods each day– and move people more than 3 trillion vehicle-miles. Growing our economy requires transportation, and transportation requires energy. The transportation sector accounts for about 30% of total U.S. energy needs and the average U.S. household spends over 15% of its total family expenditures on transportation, making it the most expensive spending category after housing.

The Vehicle Technologies Office (VTO) funds a broad portfolio of research and proof-of-concept deployment to develop new affordable, efficient and clean transportation options to enable industry to accelerate the development and widespread use of a variety of innovative transportation technologies. The research pathways focus on electrification, fuel diversification, vehicle efficiency, energy storage, lightweight materials, and new mobility technologies to improve the overall energy efficiency and affordability of the transportation system. In partnership with industry, VTO has established aggressive targets to focus research on cost-reduction, efficiency, emissions reduction and performance. VTO-funded research has reduced the cost of advanced batteries by 80% since 2008, and nearly every plug-in electric vehicle (PEV) on the road today uses VTO-developed battery technology. However, to enable greater affordability and PEV accessibility for all Americans, VTO seeks new battery chemistries and cell technologies to reduce the cost of electric vehicle battery packs by more than half, to below $80/kWh, while increasing driving range to 300 miles and decreasing charge time to 15 minutes or less by 2028. In addition, building on prior research, VTO has identified opportunities to significantly increase the power density of electric drive

systems. New innovations in motor technology – printable magnets, high-conductivity windings, and novel architectures – could lead to much smaller, very high energy density systems with twice the useful life that can enable more affordable, better performing PEVs. DOE is working to lower the cost of the power electronics and motors in an Electric Vehicle (EV) to $7/kW by 2022 from $30/kW in 2012.

Similarly, there are benefits to be gained with advanced combustion engine research. The optimization of engines, including through new models and algorithms using High Performance Computing (HPC) tools, has the potential to achieve significantly higher efficiencies than possible with current fuels and engines, improving passenger fuel economy by as much as 35% by 2030 (vs. a 2015 baseline of 36 miles per gallon). In addition, the integrated research of advanced materials, such as high-temperature alloys, and combustion strategies can not only expand engine operating parameters but also enable lighter-weight engines for better performance and efficiency.

There are also efficiency opportunities beyond vehicle components and systems. Advances in connectivity and automation have the potential to dramatically improve transportation system-level energy efficiency, energy productivity, and affordability. Leveraging high performance computing resources unique to the national laboratory system, VTO has developed robust modeling, simulation, and big data analytics capabilities, while research of advanced sensing and perception technologies, system controls, and other connected and automated technologies has advanced rapidly. Partnerships between academia and industry can apply advanced computing and data analytics capabilities with new mobility technologies to create state-of-the-art testbeds that validate and support new, optimized, highly-efficient, and affordable transportation systems.

AOI Number	Title
1a	Next-generation Liquid Electrolytes for Li-ion Cells Under Extreme Conditions
1b	Liquid Electrolytes for Li-S Cells Introduction
2	Development of State-of-the-art Lithium Sulfur and Lithium Air Battery Cells
3	High Power Density Inverters
4	Integrated Simulation of Combustion and Aftertreatment - Optimizing for Near-Zero Emissions (ISCA-ONE)
5	Demonstration of Lightweight Multi-Material Glider System
6	Low-cost Infrastructure-based Enablers for Cooperative Driving Automation
7	Implementation of Energy Efficient Mobility Systems Technologies into Real-World System Applications
8	Transportation and Energy Analysis

DOE OTT Energy Program for Innovation Clusters (EPIC) [10.29.20]

Submission Deadline for Letter of Intent: December 9, 2020
Submission Deadline for Questions: January 19, 2021
Submission Deadline for Full Applications: February 3, 2021
Expected Date for OTT Selection Notifications: April 8, 2021
Expected Timeframe for Award: April – May 2021

Anticipated Awards: 4 – 8
Available Funding: $4 million
Award Size Per Project: $500k – 1 million
Period of Performance: up to 36 months
Prime Recipient Eligibility: for-profit entities, educational institutions, nonprofits
Subrecipient Eligibility: all prime recipients and state, local, and tribal government entities
Cost Share: 20%, cash or in-kind

Purpose: fund the most creative, comprehensive, and impactful innovation-accelerating organizations that support energy and related hardware technology development and testing in regional innovation clusters—geographic concentrations of specialized skills, industries, and technology sectors. Through this FOA, the Office of Technology Transitions (OTT) seeks to support the formation and development of regional clusters supporting entrepreneurs and startups by funding innovation-accelerating organizations that demonstrate the ability to advance energy and related technologies in collaboration with and with the support of state, regional, and/or local entities.

Innovation-accelerating organizations have the potential to bolster regional economic development, strengthen national innovation capacity, and expand domestic energy-related manufacturing.

DOE encourages applications that incorporate novel approaches to or novel extensions of successful programs.

Applicant Characteristics (not listed in order of importance)

- The entity's efforts are focused on the formation and growth of startups, with a concentration on companies that are developing or commercializing hardware for energy-related applications within DOE's portfolio.
- It employs a selective process to choose participating startups.
- It hosts regular networking opportunities for startups.
- It makes introductions to customers, partners, suppliers, advisory boards, and other players.
- It provides high-growth and tech-driven startup mentorship and commercialization assistance.
- It facilitates resource sharing and arrangements for startups.
- Its resources include virtual tools and telework capabilities.
- It provides its startups with physical spaces to operate.
- It creates opportunities for startups to pitch ideas to investors, along with providing other capital formation avenues for startups.
- It assists member startups in obtaining angel money, seed capital, or structured loans.
- It has a strong mentorship program.
- It provides entrepreneurial training.
- It uses metrics and data analytics to track its performance.
- It provides access to legal and contract services.

Elements of the Regional Engagement Strategy

- Partnerships and/or working relationships with regional entities—including state and local government as well as private sector entities (including for- and non-profits).
- Energy hardware focus
    - Like the applicant, its support from regional stakeholders must concentrate on commercializing hardware within DOE's energy and related technology portfolio.
- Access to prototyping, testing, and demonstration facilities
    - Partnerships with local providers (i.e., labs/universities/private and public organizations) may provide additional demonstration or prototyping capabilities and equipment to member startups. For example, a partnership could be based on reduced fees or free access to facilities.
- A unique value proposition and description of the applicant organization's structural advantages in implementing the regional engagement plan (i.e., how the organization is built to be successful within a respective region).
- The applicant's Specific, Measurable, Actionable, Relevant, Time-bound (SMART) strategy to develop or enhance regional innovation clusters.
- The primary risk factors the applicant anticipates mitigating or overcoming to successfully implement the regional engagement strategy.
- A description of the plan's potential to be transferable to other innovation-accelerating organizations/regions.
- A description of how the plan will yield an improvement in the organization's offerings as a resource to local and regional entrepreneurs and innovators, and how it will boost the regional innovation ecosystem's productivity.
- A description of the key factors that define the applicant's regional cluster, such as available energy resources; economic challenges; shared energy challenges, needs, and markets; and capabilities and opportunities for energy innovation.

DOE EERE BTO Connected Communities; FOA # DE-FOA-0002206 [10.13.20]

Informational Webinar: November 10, 2020
Submission Deadline for Concept Papers: February 17, 2021
Submission Deadline for Full Applications: March 3, 3021
Expected Submission Deadline for Replies to Reviewer Comments: May 4, 2021

Expected Date for EERE Selection Notifications: July 1, 2021
Expected Timeframe for Award Negotiations: September 16, 2021

Anticipated Awards: 6 – 8
Available Funding: $65 million
Award Size Per Project: $3 million – 7 million
Period of Performance: 3 – 5 years
Prime Recipient Eligibility: for-profit entities; educational institutions; nonprofits; state, local, and tribal government entities
Subrecipient Eligibility: all prime recipients and FFRDCs
Cost Share: 30%, cash or in-kind

Objective
A Connected Community (CC) is a group of grid-interactive efficient buildings GEB with diverse, flexible end use equipment and other distributed energy resources (DERs) that collectively work to maximize building, community, and grid efficiency. The objective of this FOA is to select projects that will demonstrate how groups of buildings combined with other types of DERs, such as electric vehicle (EV) charging and photovoltaic (PV) generation, can reliably and cost effectively serve as grid assets by strategically deploying efficiency and demand flexibility. By demonstrating the ability of groups of buildings and DERs to modify load, the FOA outcomes will enable increased energy efficiency, reduced energy demand, and reduced environmental impact.

Under this FOA, DOE will select a portfolio of "*Connected Community*" projects totaling up to $65 million in varying climates, geographies, building types, building vintages, DERs utility/grid/regulatory structures and resource bases. Through funding these projects, DOE hopes to find and share technical and market solutions that will increase demand flexibility and energy efficiency.

For the purpose of this FOA, a DER is defined as a resource (community-scale or building-scale) that can provide all or some immediate electric and/or power needs and can also be used by the community to either reduce demand (such as energy efficiency) or supply power to satisfy the energy, capacity, or ancillary service needs of the distribution grid. In addition it should be connected to the distribution system, close to load, and the majority of produced energy should be consumed within the community. Examples of different types of DERs include photovoltaics (PV), energy storage, wind, combined heat and power (CHP), demand response (DR), energy efficiency (EE), microgrids, and electric vehicle charging infrastructure. Beyond a foundation of demand flexibility and energy efficiency, DOE expects to select a diverse portfolio of individual projects so that the combined insights from the whole portfolio will provide scalable solutions that can be applied throughout the country. Individual projects can include new construction, retrofits of existing building, residential, commercial, mixed use, campuses, and appropriate DERs. It is anticipated, but not required, that proposals will come from multi-disciplinary partnerships between energy utilities/providers, building/home developers/owners/operators, manufacturers, researchers and other key players.

Background
Domestic renewable energy production has been increasing, influencing utility electricity supply operations and creating technical challenges to efficient, cost effective, and reliable grid performance. This, and other reasons including deferred infrastructure investment, have led to a number of federal, regional, and local efforts to modernize the electric grid. At the same time, advanced building technologies utilizing smart controls are becoming more sophisticated and widely available, allowing buildings to become more responsive to occupant and grid needs. Similarly, advances in electric vehicles (EVs) and energy storage technologies are offering pathways to interact with the electric grid in more dynamic ways. EVs are forecasted to be the largest net increase in load to the utility system in the next twenty years. Charging of these vehicles will mostly be attached to buildings. By coordinating the loads of buildings with the loads of EVs, and managing those loads with the grid, it both increases the opportunity to provide grid services and decreases the risk of high costs for building/vehicle owners and for the grid.

At the same time an increasing number of truck fleets are planning to electrify their vehicles not only to address emissions but also to lower operating costs. This FOA recognizes the challenges and opportunities that relate to this changing energy landscape and addresses the role that demand side strategies, including buildings, electric vehicles with smart charge management and other DERs as well as supply side strategies, can offer.

The Building Technologies Office (BTO) has a mission to develop and accelerate the adoption of cost-effective technologies, techniques, tools, and services that enable high-performing, energy-efficient, and demand-flexible residential and commercial buildings in both the new and existing buildings markets. The Office's overall goal is to improve the energy efficiency and productivity of buildings without sacrificing occupant comfort or product performance.

Progress towards achieving this goal will make building energy costs more affordable and reduce the environmental impact of energy-related activities to the benefit of American households and businesses.

In support of this goal, BTO has developed a Grid-interactive Efficient Buildings (GEB) strategy which aims to advance the role buildings can play in energy system design, operations and planning. This is achieved by optimizing energy consumption with an integrated approach to energy efficiency and flexibility. The GEB strategy recognizes that:

- Building end uses can be dynamically managed to reduce energy cost, consumption, help meet grid needs, and minimize electricity system costs, while meeting occupants' comfort and productivity requirements;
- Technologies such as PV, storage, CHP, EVs and their charging infrastructure, other DERs, and microgrids can be co-optimized with buildings to provide greater value and resiliency to both utility customers and the electricity system; and
- The value of energy efficiency, demand response, and other services provided by behind-the-meter DERs varies by building type, location, hour, season, and year. A key part of this strategy includes utilizing efficient building design, operational strategies, and highly efficient, innovative building equipment coupled with smart technologies for building energy management. These are areas of core technological investment for BTO.

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Category	Description
Grid Issues and Services to Address	Each project must: • Address increased integration of renewable energy resources and at least one more electric grid issue relevant to transmission and/or distribution as shown in Figures 2 and 3. • Provide at least two defined and quantifiable grid services that reliably and cost effectively address targeted grid issues. • Incorporate resilience at a defined scale (e.g. Building, Campus, Community, Feeder, Substation etc.) enhancing the ability to withstand or recover from disruptions. • Include the amount of load flexibility needed to provide a viable demonstration of the provision of grid services at a scale meaningful to participate in wholesale markets and/or at the distribution grid level over multiple seasons. See Appendix J for more detail. Projects are encouraged to: • Address more than two grid issues. • Provide more than two grid services to address the targeted grid issues. • Scale or stage community energy supply and consumption using load control, storage and generation in order to operate the community at varied levels of service during multi-day power outages.
Energy Efficiency	Each project must: • Significantly improve the energy efficiency performance of buildings in the community over an appropriate baseline. Projects are encouraged to: • Improve energy efficiency by more than 30% over the baseline while meeting objectives and maintaining occupant comfort, building performance, and economic viability.
Building Load Flexibility	Each project must:

Provision and Metrics	• Provide a significant and quantifiable amount of building load flexibility that provides shed, shift, and/or modulation grid services while maintaining comfort and performance. • Use specific performance metrics to quantify the services provided, such as maximum, average, and minimum time dependent flexibility (e.g. kW and % of the applicable electricity network system).
DER Types, Capacities (as applicable) and Quantities	Each project must: • Include, in addition to demand response and energy efficiency, at least two other types of DERs (such as PV, electric vehicles, electrical or thermal energy storage19, etc.) that support emissions reduction, demand flexibility, affordability, and resiliency. These may be building level installations or community scale installations. Projects may also consider: • If applicable, demonstrating smart managed charging of large scale EVs (either 1000's of vehicles or high power charging at depots) as part of the coordinated community controls approach. • Include innovative ways to deliver charging for individuals without personal parking (i.e. park on the street or live in a multi-unit dwelling).
Coordinated Controls for Energy Efficient and Flexible Load Operations	Each project must: • Have a coordinated control and integration approach, to be used for energy efficiency and load flexibility to provide coordinated management both within individual buildings and across multiple buildings and/or DERs. • Focus on groups of buildings with integrated DERs that when aggregated demonstrate measurable added value to both the occupants and the grid beyond what can be achieved on an individual building basis. • Identify what skills and training requirements are associated with multi-building energy management. • Consider how the community will support ongoing operations and maintenance to ensure sustainability of the flexibility strategies.
Implementation Pathways	Each project must: • Demonstrate a pathway to quantifiably decrease the set up time and challenges associated with the design, installation, and integration and commissioning of hardware, software, controls and communications to make buildings grid interactive. • Integrate technologies, building infrastructure, and/or contractual arrangements that are broadly replicable across the U.S. building stock and electricity business and regulatory environments. Projects are encouraged to: • Systemically address interoperability throughout their project and use appropriate open standards for the grid or utility signal connection for their application. Examples of open standards include IEEE 2030.5, OpenADR, OpenFMB, DNP3, and The Open Charge Point Protocol(OCPP) .
Recruitment	Each project must: • Include strategies for recruitment and retention of connected community participants. Projects are encouraged to (if applicable): • Partner with Clean Cities coalitions (cleancities.energy.gov)
Business Model Innovation	Each project must: • Include a business model that can be used to achieve economic viability at scale. It should recognize the technological, business and contractual approaches that will be potentially attractive to customers, utilities, builders and other key stakeholders.
Project Partners & Stakeholders	Each project must: • Include teams composed of critical partners needed to successfully implement the project. It is recognized that teams will differ depending on regional and grid needs. Projects are encouraged to: • Include representation of grid resources/assets (e.g. electric utility, efficiency utility, community choice aggregator), building owners or related market actors (e.g. home builder, building owner, developer, building manager, engineering firm), technology

	manufacturers and vendors, state or local governments, Clean Cities coalitions (if applicable), and researchers (e.g. national lab, university, consulting firm).
Project Stakeholder Benefits	Each project must: • Provide benefits to the power grid, building and DER owners, and building occupants both in terms of resource and fuel cost savings as well as non-energy benefits such as productivity enhancements, health and safety improvements, asset value increases, etc. and the benefits to the broader society (e.g. public health, environment, economic development and job impacts, etc.) provided by the proposed community project. Projects are encouraged to: • Directly support corporate, utility, state, or local emission reduction goals where applicable. • Ensure equitable access to community energy resources, affordable housing, and other community improvements. • Provide increased community resilience to grid outages and other extreme events.
Data and Analysis Methods	Each project must: • Implement a well-thought out data collection and analysis plan, working with the Connected Communities National Coordinator (described following), that includes sensing and software/analytical platforms, to measure, collect, and analyze data to demonstrate the ability of the project to reduce load as well as shift load, modulate load, or generate energy. • Include the data types identified in Table 2: Data Requirements
Occupant Experience	Each project must: • Collect data to understand the availability of building services (e.g. hot water, lighting) on the occupant experience and comfort and productivity levels should be documented. • Work to ensure the occupant experience is maintained or improved, including during times that grid services are being provided.
Cybersecurity and Privacy	Each project must: • Include measures that will be utilized in the defense, detection, and mitigation of cyber security threats covering both the application of the project, and as scaled to future communities. • Identify privacy provisions for the project and how they would be scaled. Projects are encouraged to: • Reduce the need for collected data to preserve privacy and increase cybersecurity.
Scalability and Replication	Projects are encouraged to: • Use approaches that can be easily applied and scaled to other communities and distribution networks. • Include a plan for replication in other communities • Identify the challenges and needs to scale the connected community.
Outreach	Each project must: • Include a communication plan to educate relevant industries, public officials, professionals, the public and stakeholders regarding the project's approach, implementation and value.

DOE EERE Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) – 2020; FOA # DE-FOA-0002196 [9.25.20]

FOA Issue Date: September 25, 2020
Informational Webinar: October 5, 2020
Submission Deadline for Concept Papers: November 5, 2020
Submission Deadline for Full Applications: January 20, 2021
Expected Date for EERE Selection Notifications: June 2021
Expected Timeframe for Award Negotiations: September 2021

Available Funding: $61 million

Award Size Per Project: $750k – $3 million
Period of Performance: up to 3 years
Cost Share: 20%

Objectives:

The objective of this Funding Opportunity Announcement (FOA) is to research and develop next-generation building technologies that have the potential for significant energy savings and improved demand flexibility, affordability, and occupant comfort. An additional goal is to advance building construction, remodeling, and retrofit practices, and associated workforces.

Background and Purpose:

This FOA is being issued by the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Building Technologies Office (BTO). This section describes the overall goals of BTO and the type of projects that are being solicited for funding support through this FOA.

The DOE mission is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. As explained in the Energy Policy Act (EPAct 2005; 42 U.S.C. §16191), "The Secretary shall conduct programs of energy efficiency research, development, demonstration, and commercial application." Such activities include "increasing the energy efficiency of buildings" and developing "cost-effective technologies, for new construction and retrofit, to improve the energy efficiency and environmental performance of buildings, using a whole-buildings approach, including onsite renewable energy generation."

Powering our homes, offices, schools, hospitals, restaurants, and stores consumes a lot of energy. Residential and commercial buildings account for approximately 40% of the nation's total energy demand – greater than that for either industry (32%) or transportation (29%) – and about 75% of all electricity use (and even more of peak power demand). The resulting annual national energy bill for buildings totals over $410 billion.

Improving the energy efficiency of buildings reduces energy costs in homes and commercial buildings. More than half of the nation's more than 119 million homes and 5.6 million commercial buildings were constructed before 1980—prior to the existence of today's efficient products and practices. By saving money on energy costs there is more money available to flow into other sectors of the economy. Unlocking the energy savings of these buildings through efficiency improvements, while maintaining or improving occupant comfort, represents a significant economic opportunity.

Improving the energy efficiency and flexibility of buildings alleviates pressure on our electric grid and extends our energy resources as we diversify to greater use of an all-of-the-above energy supply strategy. This helps to ensure a reliable energy system well into the future.

BTO leads a network of national laboratory, university, small business, and industry partners to develop innovative, cost-effective solutions—better products, better new homes, better ways to improve older homes, and better buildings in which we live and work. The United States has made significant progress in improving building energy efficiency over the last 30 to 40 years, due in part to the successful efforts of BTO.

The Office's high-impact research has contributed to significant improvement in building energy efficiency including whole building-as-a-system solutions as well as new technologies such as solid-state lighting (SSL), energy saving windows, heat pump water heaters, and high-efficiency furnaces and air conditioners.

Technology Space and Strategic Goals:

BTO's overall goal is to improve the energy productivity of buildings without sacrificing occupant comfort or product performance. Progress towards achieving this goal will make building energy costs more affordable to the benefit of American families and businesses.

Building energy performance and the efficiency and affordability of consumer products have improved across the design, construction and product development industries due in large part to DOE research and development, leveraging an array of technologies supported by BTO. This has helped result in increased adoption of energy efficient technologies. For example, today, light emitting diodes (LEDs) account for over 30% of all general lighting applications,

up from less than 1% in 2010. DOE projects that by 2030, LEDs will reach 80% of all lighting sales, saving Americans $26 billion per year in electricity costs.

Other examples include refrigerators and windows. Today, more than 100 million refrigerators in homes across the country use an advanced compressor that can trace its roots to DOE's Research and Development (R&D) activities in the late 1970s. In fact, today's average refrigerator is 20% larger, has more features, costs half the price, and uses one-quarter the energy than it did four decades ago4. Similarly, modern windows have over three times the insulation value compared to windows before the 1970s5,6. The core technology driving these advances was sponsored by DOE.

BTO research focuses on the highest-impact approaches, targeting the most promising opportunities, to reduce the energy intensity of new and existing, commercial and residential buildings, while balancing the need to maintain occupant comfort and productivity, and ensure product performance. BTO's R&D of next-generation building technologies includes heating, ventilation and air conditioning (HVAC), lighting, refrigeration, appliances, windows, opaque envelope, storage, sensors & controls, modeling, and data analytics, as well as other building integration technologies; all of which are addressed in this FOA.

As a complement to the integration research already being conducted for design and operations, BTO's recently launched Advanced Building Construction Initiative (ABC)7 seeks to further innovation in construction and renovation processes; ABC aims to help the U.S. construction industry achieve affordable, high-performance, resilient, energy efficient buildings, including by investing in new technologies that can be mass produced cost competitively. As parts of the construction industry seek to improve their overall productivity, ABC is working to ensure that energy efficiency solutions are integrated into all parts of any industry transformation, from design and manufacturing through construction and installation. Furthermore, ABC is working with industry, researchers, and other stakeholders to ensure that technological and process improvements not only result in highly performing and efficient buildings, but also can be deployed quickly with minimal onsite construction time, are affordable and appealing to building owners, investors, and occupants, and have lower lifecycle impacts.

Improving the demand flexibility of buildings can provide significant energy savings. Just in energy efficiency alone, building technologies have the potential to provide significant energy savings on an annual basis compared to business as usual (such as described by the Annual Energy Outlook (AEO) reference case), and additional savings can be achieved from short term reduction or shifting of energy use. There are over 18 billion devices connected to the Internet globally, 9.5 billion of which are internet-of-things (IOT) devices9 and the market for these devices is accelerating rapidly. In 2015 this market was expected to grow by about 20% annually, it is now projected to grow by 39% annually. BTO's grid-interactive efficient buildings (GEB) research will take advantage of the potential energy savings associated with these devices across the entire building sector, commercial and residential alike.

The GEB vision will allow American businesses and families to save energy and reduce their utility bills automatically and without impacting comfort or productivity by allowing buildings to provide grid services through flexible building loads. BTO is an active participant in DOE's broader Grid Modernization Initiative (GMI), a comprehensive effort of different DOE offices and national laboratories with public and private partners to help shape the future of our nation's grid.

BTO has issued the BENEFIT FOA annually since 2014. The 2020 BENEFIT FOA will invest up to $80 million across 2 topic areas to allow all interested parties to research and develop high-impact technologies and practices that will improve energy productivity, improve flexibility, security and resilience, as well as lower energy costs.

Topic 1: Building Technology Research, Development and Field Validation: High-impact, affordable building technologies to improve energy productivity and demand flexibility without negatively impacting occupant comfort.

Topic 2: Advanced Building Construction: Building envelope R&D and field validation as well as integration of technological and other advances into mass-produced building practices for manufactured homes and modular classrooms, including training issues such as improving quality installations and quality control.

DOE Energy Storage Grand Challenge [7.9.20]

Submission Deadline for RFI: August 31, 2020

Background

In September 2018, Congress passed the Department of Energy Research and Innovation Act (Public Law 115-242) No. 114-246, codifying the efforts of the DOE's Research and Technology and Investment Committee (RTIC). The Energy Storage Subcommittee of the RTIC is co-chaired by the Office of Energy Efficiency and Renewable Energy and Office of Electricity and includes the Office of Science, Office of Fossil Energy, Office of Nuclear Energy, Office of Technology Transitions (OTT), ARPA-E, Office of Strategic Planning and Policy, the Loan Programs Office, and the Office of the Chief Financial Officer.

In January of 2020, the DOE announced the Energy Storage Grand Challenge (ESGC), a comprehensive program to accelerate the development, commercialization, and utilization of next-generation energy storage technologies and sustain American global leadership in energy storage. The ESGC builds on the $158 million Advanced Energy Storage Initiative announced in President Trump's Fiscal Year 2020 budget request.

The vision for the ESGC is to create and sustain global leadership in energy storage utilization and exports with a secure domestic manufacturing supply chain that is independent of foreign sources of critical materials by 2030. While research and development (R&D) is the foundation of advancing energy storage technologies, the DOE recognizes that global leadership also requires addressing associated challenges that lead to commercialization and widespread adoption of energy storage technologies.

The ESGC is a cross-cutting effort managed by RTIC. The DOE established the RTIC in 2019 to convene the key elements of the DOE that support R&D activities, coordinate their strategic research priorities, identify potential cross-cutting opportunities in both basic and applied science and technology, and accelerate commercialization.

Using a coordinated suite of R&D funding opportunities, prizes, partnerships, and other programs, the ESGC established the following five cross-cutting tracks: (i) Technology R&D, (ii) Manufacturing and Supply Chain, (iii) Technology Transitions, (iv) Policy and Valuation, and (v) Workforce. These five cross-cutting tracks have developed a draft Roadmap that will be updated based on feedback from this RFI as well as other ongoing DOE efforts, such as workshops, webinars, and other engagements with stakeholders. The roadmap identifies six use cases as neutral guideposts to provide a framework for the ESGC. These use cases include (i) facilitating an evolving grid, (ii) serving remote communities, (iii) electrified mobility, (iv) interdependent network infrastructure, (v) critical services, and (vi) facility flexibility, efficiency and value enhancement. More information on the use cases and the draft Roadmap can be found here: https://www.energy.gov/energy-storage-grand-challenge/downloads/energy-storage-grand-challenge-draft-roadmap.

Each track has developed a set of RFI questions related to their respective areas and target audience. This RFI is divided into five sections that represent each track as follows:

The purpose of the **Technology Development Track** covered in Section 1 is to develop and implement an R&D ecosystem that strengthens and maintains U.S. leadership in energy storage innovation. To help realize the vision of U.S. energy storage leadership, the Technology Development track will establish user-centric use cases and technology pathways to guide near-term acceleration and long-term leadership in energy storage technologies. A set of future energy storage use cases, enabled by aggressive cost reductions and performance improvements, will help guide R&D objectives across a diversity of storage and enabling technologies. A full description of the use case framework is discussed in the draft Roadmap. After identifying a portfolio of technologies that have the potential to achieve major functional improvements, ensuring long-term leadership includes augmenting the R&D ecosystem to enable constant innovation. The ecosystem includes partnerships, consortia, infrastructure, and other long-term resources that accelerate the journey from concept to commercialization.

The purpose of the **Manufacturing and Supply Chain Track** covered in Section 2 is to strengthen U.S. leadership in energy storage through strengthening the manufacturing supply chains that produce state-of-the-art and emerging energy storage technologies, including supporting technologies that enable seamless integration into larger systems and the grid. Strengthening U.S. manufacturing of energy storage technologies occurs through commercializing and scaling innovations that make domestic manufacturers more competitive. Increasing U.S. manufacturing competitiveness can come through multiple ways, including directly lowering the cost of manufacturing, lowering the lifecycle cost of technologies through improved performance and/or longer service lifetimes, diversifying sources for critical materials – particularly increasing domestic sources – and through accelerating the process in which new

materials or components are integrated into systems and reliably produced at commercial scales to meet rapid deployment/demand.

The purpose of the **Technology Transitions Track** discussed in Section 3 is to support the ESGC and strengthen U.S. leadership in energy storage by accelerating commercialization and deployment of energy storage innovations through validation, financing, and collaboration. This Track focuses on potentially bankable business models that build off of the Technology R&D use cases, and may also consider other use cases that are ready for commercialization and could support widespread adoption of storage. These include behind the meter and utility-scale storage, as well as stationary and mobile storage. The approach will concentrate on addressing barriers to bankability and attracting private investment. Where appropriate, lessons learned will be leveraged from previous work on standardization of solar contracts and capital market access for renewables. For example, minimizing perceived risk, such as uncertain technology performance through formalized data sharing, can lower risk premiums, improve warranties, and spur new insurance products that may attract more cost effective investment. Policies, incentives, and analysis tools that support bankability will also be considered.

This track has identified a potential need for proactive market validation, demonstration, standards, and dissemination of information to give market participants confidence in energy storage assets, thus reducing project risk, lowering project costs, increasing investment, and accelerating market demand.

The purpose of the **Policy and Valuation (P&V) Track** discussed in Section 4 is to provide information and analysis to appropriately value energy storage in the power, transportation, buildings, and industrial sectors. The P&V track will develop a coordinated, DOE-wide program that leverages the expertise and capabilities of the national laboratories to provide stakeholders with cutting-edge data, tools, and analysis to enhance their policy, regulatory, and technical decisions. Stakeholder engagement will be systematic and recurring to guarantee the DOE provides tailored solutions for high priority needs. Providing stakeholders with the necessary information and capabilities to make informed decisions will help ensure that storage is properly valued, effectively sited, optimally operated, and cost-effectively used to improve grid and end-user reliability and resilience.

The purpose of the **Workforce Development Track** covered in Section 5 is to focus the DOE's technical education and workforce development programs to train and educate the workforce, who can then research, develop, design, manufacture, and operate energy storage systems widely within U.S. industry. The lack of trained workers has been identified as a concern for growth of the U.S. industrial base, including many areas of energy storage. To have world-leading programs in energy storage, a pipeline of trained research and development staff, as well as workers, is needed. For workforce development in energy storage, the DOE will support opportunities to develop the broad workforce required for research, development, design, manufacture and operation. The DOE can play a critical role in facilitating the development of a workforce that is necessary to carry out the DOE's specialized mission. Energy storage is a highly specialized area of work and yet not a focus of 2 or 4 year college curricula. Therefore, it is appropriate that the DOE take the lead in strengthening a pipeline of qualified individuals who can fulfill employment needs at all stages of energy storage development, production and deployment.

Purpose: The purpose of this RFI is to solicit feedback from interested individuals and entities, such as, industry, academia, research laboratories, government agencies, and other stakeholders to assist the ESGC with identifying market opportunities and challenges – both technical and financial -- for the development, commercialization, production, and deployment of energy storage technologies. This is solely a request for information. In issuing this RFI, the DOE is not seeking to obtain or utilize consensus advice and/or recommendations. The DOE is not accepting applications at this time as part of the ESGC.

Comments must be submitted electronically to rticstorage@hq.doe.gov.

DOE EERE BTO RFI on Research and Development Opportunities for Opaque Building Envelopes; FOA # DE-FOA-0002162 [6.4.20]

This RFI solicits feedback from industry, academia, research laboratories, government agencies, and other stakeholders on BTO's opaque envelope program and its future directions and priorities. To clarify these, BTO has

developed a report that is structured around five key areas of technology R&D. The report identifies current envelope characteristics, R&D opportunities, integration approaches, and implementation pathways. BTO is requesting feedback on each of these areas. BTO is also requesting feedback on planned technical objectives, technical targets, tools, overall R&D activities, and estimates of program impacts. This is solely a request for information and not a Funding Opportunity Announcement (FOA). EERE is not accepting applications.

Webinar: GEB Technical Report Series: Envelope & Windows

DOE EERE BTO RFI on Research and Development Opportunities for Windows; FOA # DE-FOA-0002161 [6.4.20]

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on BTO's windows R&D and its future directions and priorities. To clarify these, BTO developed the RDO report, which is structured around four key areas. The RDO report identifies opportunities and challenges, technology development, integration, and implementation. BTO is requesting feedback on each of these areas. BTO is also requesting feedback on planned technical objectives, technical targets, tools, and overall R&D activities and

estimates of program impacts. BTO will not develop a FY20 Funding Opportunity Announcement (FOA) based on the feedback from the RFI. This RFI includes guidance on how to provide feedback that will inform updates to the RDO report itself, and ultimately, the strategic direction of the portfolio moving forward.

Webinar: GEB Technical Report Series: Envelope & Windows

DOE Small-Scale Solid Oxide Fuel Cell Systems and Hybrid Electrolyzer Technology Development; FOA # DE-FOA-002300 [5.28.20]

Submission Deadline for Full Proposals: July 8, 2020
Anticipated Number of Awards and Amount of Funding: DOE anticipates $30 million will be awarded across the three areas of interest; individual awards will be in the $3 million - $23 million range.

Scope of Solicitation / Topic Areas
Applications are sought to develop advanced technologies that can maturate the present state of Solid-Oxide Fuel Cell (SOFC) and Solid-State Electrolyzer Cell (SOEC) technologies to a point of commercial readiness for power generation and hydrogen production. This solicitation includes three Areas of Interest:

AOI 1: Small-Scale Distributed Power Generation SOFC Systems (5-25kW)
Projects funded under this FOA will leverage existing cell technology and have shorter development cycles with potential for near-term (~5 years) commercial implementation. The design, fabrication and testing of small- scale natural gas-fueled SOFC systems can establish the technology and manufacturing base for MWe-scale SOFC systems and accelerate the development of lower cost, high efficiency coal-based utility-scale power generation with >90% carbon capture for the nation's power grid.

Beginning of project: TRL 5. Applicants are expected to have their cell technology (i.e., material chemistries and cell design) fully developed for application into commercial systems prior to this proposed work to develop the SOFC system.

End of project: TRL 7. Successful projects will result in the design and construction of 5-25 kW SOFC distributed power generation system prototypes followed by validation testing in a relevant environment.

AOI 2: Hybrid systems using solid oxide systems for hydrogen and electricity production including the validation and development of materials and systems required for improving cost, performance and reliability.
Projects awarded under this AOI will: validate materials, stacks, balance of plant (BOP), and operation of SOFC systems that can produce both hydrogen and electricity; validate the performance of existing systems and improvements to operation, materials and BOP to evaluate performance under relevant conditions; provide a complete techno-economic analysis on the SOEC system for the application, and demonstrate improved cost, performance, robustness, reliability, and endurance of SOEC stack and BOP technology.

These awards will be TRL 3-5, research and development projects aimed at maturing concepts and technologies to a point that they are tested in simulated environments as components within a sub-scale system.

AOI 3: Cleaning of coal-derived syngas for use as SOFC fuel and testing of single and multiple cells on syngas. Applicants are expected to leverage existing equipment and/or develop new processes to clean the contaminants within coal-derived syngas for the SOFC performance testing to be able to validate a degradation rate less than 0.2%/1000 hours – the scope of the projects awarded under this FOA will not include SOFC cell or anode catalyst development.

These awards will be TRL 3-5, research and development projects aimed at maturing concepts and technologies to a point that they are tested in simulated environments as components within a sub-scale system. The system will be a large-lab or small pilot system representative of a much larger cooling system that would be integrated with a power plant.

DOE EERE AMO FY2020 AMO Critical Materials FOA: Next-Generation Technologies and Field Validation; FOA # DE-FOA-0002322 [5.14.20]

Submission Deadline for Concept Papers: June 25, 2020
Submission Deadline for Full Applications: August 11, 2020
Expected Date for EERE Selection Notifications: Winter 2020
Anticipated Number of Awards and Amount of Funding: The DOE anticipates making 5-10 awards ranging from $500,000 for Topic Area 2, and $10 million to $30 million for Topic Area 1.

Description
The FOA seeks applications to (1) advance near-term, system-integrated, energy storage solutions toward commercial deployment with fossil assets; (2) mature promising mid-technology-readiness-level (TRL), component-level energy storage solutions toward eventual system integration with fossil assets; (3) develop innovative, low-TRL concepts and technologies that offer game-changing benefits for fossil assets. Energy storage combined with fossil energy assets offers a suite of benefits to asset owners, the electricity grid, and consumers. These benefits include a more reliable and affordable energy supply, cleaner environmental performance, and stronger energy infrastructure. The FOA seeks a variety of technology approaches to integrate fossil assets with thermal, chemical, and potential energy storage applications.

NSF Civic Innovation Challenge (CIVIC); FOA # NSF 20-562 [4.7.20]

Submission Deadline for Full Proposals (Stage 1): August 3, 2020
Submission Deadline for Full Proposals (Stage 2): May 5, 2021
Available Funding: $9 million

Synopsis of Program:

The Civic Innovation Challenge (CIVIC) is a research and action competition in the Smart and Connected Communities (S&CC) domain designed to build a more cohesive research-to-innovation pipeline and foster a collaborative spirit. Building on the NSF S&CC program and the extensive S&CC ecosystem, CIVIC aims to accelerate the impact of S&CC research, and deepen cooperation and information sharing across sectors and regions. CIVIC will lay a foundation for a broader and more fluid exchange of research interests and civic priorities that will create new instances of collaboration and introduce new areas of technical and social scientific discovery. CIVIC will fund projects that can produce significant community impact within 12 months (following a four-month planning phase) — in contrast to many community-university partnerships that take years to provide tangible benefits to communities — and have the potential for lasting impact beyond the period of the CIVIC award.

CIVIC introduces several unique features that differentiate it from the NSF S&CC program: (1) CIVIC flips the community-university dynamic, asking *communities* to identify civic priorities ripe for innovation and then to partner with researchers to address those priorities; (2) CIVIC focuses on research that is ready for piloting in and with

communities on a short timescale, where real-world impact can be evaluated within 12 months; (3) CIVIC requires the inclusion of civic partners in the core project team, to emphasize civic engagement; and (4) CIVIC organizes and fosters "communities of practice" around high-need problem areas that allow for meaningful knowledge sharing and cross-site collaboration during both pre-development and piloting. **For purposes of clarity, civic partners may include local, state, or tribal government officials; non-profit representatives; community organizers or advocates; community service providers; and/or others working to improve their communities.**

CIVIC is organized as a two-stage competition with two tracks centered around the following topic areas:

- Track A. Communities and Mobility: *Offering Better Mobility Options to Solve the Spatial Mismatch Between Housing Affordability and Jobs*; and
- Track B. Resilience to Natural Disasters: *Equipping Communities for Greater Preparedness and Resilience to Natural Disasters*.

In the first stage (Stage 1), up to 12 awards per track will be made for Planning Grants – each with a budget of up to $50,000 for four months to undertake pre-development activities, including solidifying the team, maturing the project plans, and preparing to submit a well-developed full proposal for Stage 2. **Only awardees of Stage 1 will be eligible to submit proposals for Stage 2.**

In the second stage (Stage 2), up to four teams per track will be selected from Stage 1 award recipients to receive a full award — each with a budget of up to $1,000,000 for up to 12 months to execute and evaluate their research-centered pilot projects.

DOE EERE BTO Connected Communities; FOA # DE-FOA-0002291 [3.27.20]

Description
This RFI pertains to a draft Funding Opportunity Announcement (FOA) planned to be issued by the Office of Energy Efficiency and Renewable Energy (EERE), Building Technologies Office (BTO), in collaboration with the Vehicle Technologies Office (VTO), Solar Energy Technologies Office (SETO) and the Office of Electricity (OE) on Connected Communities of Grid-interactive Efficient Buildings.

Background
BTO has a mission to develop and accelerate the adoption of cost-effective technologies, techniques, tools, and services that enable high-performing, energy-efficient, and demand-flexible residential and commercial buildings in both the new and existing buildings markets. The Office's overall goal is to improve the energy productivity of buildings without sacrificing occupant comfort or product performance – in other words to use energy more productively and efficiently, not simply to use less energy. Progress towards achieving this goal will make building energy costs more affordable to the benefit of American households and businesses.

In support of this goal, BTO has developed a Grid-interactive Efficient Buildings (GEB) strategy which aims to advance the role buildings can play in energy system operations and planning by optimizing across distributed energy resources (DERs), such as flexible loads, energy generation, and storage. The GEB strategy drives towards greater affordability, efficiency, resiliency, and reliability, recognizing that:

- Building end uses can be dynamically managed to reduce energy cost, consumption, helpmeet grid needs, and minimize electricity system costs, while meeting occupants' comfort andproductivity requirements;
- Technologies such as photovoltaics (PV), electrochemical and thermal energy storage,combined heat and power (CHP), electric vehicles (EVs), other DERs, and microgrids can be co-optimized with buildings to provide greater value and resiliency to both utility customers and the electricity system; and
- The value of energy efficiency, demand response, and other services provided by behind-the-meter DERs can vary by building type, location, hour, season, and year.

A key part of this strategy includes utilizing efficient building design and operational strategies coupled with smart technologies (sensors, actuators, controllers, etc.) and highly efficient building equipment for building energy management. These are areas of core technological investment for BTO.

The vision of GEB is the integration and continuous optimization of DERs for the benefit of the buildings' owners, occupants, and the electric grid. Improving the energy efficiency and demand flexibility of buildings alleviates pressure on the electric grid and extends our domestic energy resources. Given the importance of DER integration in this future funding opportunity announcement, BTO is collaborating on a core set of research questions with SETO, VTO, and OE. Each of these program offices has unique perspective and expertise that will contribute to the Connected Communities effort.

Draft FOA Topic Area: Connected Communities
DOE plans to make a significant investment in Connected Communities because of the potential for high-performance buildings and managed EV charging that effectively leverage smart technology, distributed energy resources, flexible loads and grid integration to cost-effectively reduce energy use and peak demand while improving the occupant experience.

The goal of this potential FOA is to demonstrate, through regional pilots, the ability of groups of efficient buildings, including some level of EV charging infrastructure, to provide additive benefits to the electricity system including peak demand reduction, reduced capacity and energy needs, and other grid services through demand flexibility. This includes the ability to reduce, shift and modulate load or generate energy in both existing and new communities across diverse climates, geographies, building types and grid/regulatory structures, while maintaining (if not enhancing) occupant satisfaction and productivity. For the purpose of this topic, a "connected community" is a group of grid-interactive efficient buildings with diverse, flexible end use equipment that collectively work to maximize building and grid efficiency without compromising occupant needs and comfort. Connected communities builds on BTO's current Grid-interactive Efficient Buildings (GEB) research: https://www.energy.gov/eere/buildings/grid-interactive-efficient-buildings and Zero Energy Ready (ZE/R) strategies.

Current connected communities take advantage of highly efficient homes and commercial buildings and multi-disciplinary partnerships between utilities, building developers/owners and researchers. These communities leverage innovation in high performance building design, operation and technology (i.e. dynamic windows, heat pumps, and smart thermostats). In addition, the growing number of installed smart devices and advanced data-analytics greatly increases flexibility of buildings to respond to grid needs. Connected communities include smart connected neighborhoods and co-managed multi-use developments with shared infrastructure.

Connected communities have demonstrated new energy, reliability, affordability, and resilience benefits for homeowners and businesses. For example, through work funded by the Building Technologies Office, ORNL researchers have found that the actual energy consumption of the homes in the Reynolds Landing Smart Neighborhood™ consumed 44% less energy (kWh) as compared to similar homes built to minimum code requirements in Alabama. Researchers are also learning that these homes can reduce their peak winter heating demand (kW) by ~34% from what a traditional, all-electric community would have otherwise needed because of the highly efficient envelope and capability to shift heating and cooling loads. In addition to coordination of diverse, flexible building loads, connected communities can potentially share infrastructure and energy assets to achieve economies of scale, improve system efficiency, reduce operations, maintenance and capital costs, and to island as part of a microgrid that stages loads to operate during power outages.

A key advantage to connected communities is that load diversity, storage and generation across buildings and EVs can be leveraged to create more economic value per unit of installed capacity while reducing emissions. This is especially true for physically connected communities with shared systems. A simple example of the advantage gained from load diversity is to consider two buildings subject to high demand charges with peak electric load occurring at different times. One battery or other storage device, installed for both buildings, can be used to effectively reduce the peak demand of both buildings, whereas in a single-building approach, each building would likely install its own battery to achieve the same benefit. Extending the example to more than two buildings can increase the value of the battery even further.

Similarly, in a multi-building complex with a shared central thermal plant, to the extent that the buildings' heating and cooling loads are not coincident with each other, the capacity of the shared plant can be less than the sum of the capacities if each building were to install its own thermal plant.

A key objective of the planned Connected Communities FOA is to have a coordinated and diverse set of validation projects that demonstrate the ability of large groups of buildings in aggregation to improve their energy efficiency, resilience, and productivity while serving as reliable grid assets to meet specific and quantifiable grid needs. A coordinated research approach, in which projects serve as a cohort to share challenges and best practices between each other and publicly, will allow DOE to synthesize information across many projects that include multiple building types, applications, vintages and sectors, climates, electricity regulatory and market environments, occupancy/programmatic approaches, business models and occupant impact in an effort to scale innovation.

DOE EERE FY 2020 Subsurface Imaging Lab Call [3.16.20]

FOA Issue Date: March 16, 2020
Submission Deadline for Full Proposals: April 20, 2020
Anticipated Award Notifications: July 2020

Overview and Purpose
Over the past five years, the U.S. Department of Energy's Geothermal Technologies Office (GTO) sponsored R&D to adapt the Play Fairway Analysis (PFA) technique to the geothermal industry, targeting the identification of undiscovered or "hidden" hydrothermal systems and incorporating the regional or basin-wide distribution of known geologic factors that control the occurrence of a particular geothermal system. By conducting PFA in unexplored or underexplored regions, or by using new play concepts in basins with known geothermal potential, GTO investments can quantify and reduce uncertainty in geothermal exploration—ultimately yielding a potential 30 gigawatts of additional power from energy hidden deep in the Earth (Williams, 2008). The highly successful PFA effort yielded many favorable prospects that require further study.

In FY 2020, the GTO Hydrothermal Program will continue its emphasis on discovering hidden geothermal systems through a multi-pronged approach that includes the following RD&D paths:

(1) Improving the understanding of heat source and occurrence for certain hidden play types that have not yet been demonstrated in the U.S.
(2) Development of subsurface imaging technology, and
(3) Validation of recently developed play-based exploration methods, including through drilling (outside the scope of this call, see funding opportunity DE-FOA-0002219)

This lab call focuses on (1) and (2) above, specifically for areas where traditional temperature gradient drilling cannot be used to identify a resource. Geothermal plays of interest under this lab call present a significant challenge in resource exploration and confirmation due to the high cost of deep exploratory wells as compared to shallower temperature gradient drilling, and the relatively higher risk profile for projects drilling fewer, more expensive wells. In addition, shallow temperature manifestations of the potential for heat from certain geothermal plays may be masked by shallow aquifers and this significantly limits the utility of commonly-used conventional exploration methods.

Significant progress has been made in recent years adapting advanced geophysical techniques from oil and gas into certain geothermal settings. Direct transfer of technology may not be possible for all play types, as subsurface features in geothermal settings are often much more difficult to image using seismic methods when compared to oil and gas plays. The cost of certain advanced geophysical surveys may also approach that of drilling a slim well, thus this approach to lowering risk will be most advantageous for plays where exploration and confirmation drilling is expected to be relatively high cost.

Research Objectives
Having the ability to image structural features or other controls on permeability in geothermal systems would provide geothermal explorers a critical constraint on the distribution of temperature and fluids in the subsurface. RD&D resulting in new imaging capabilities is expected to greatly improve the ability to target exploration wells, thereby improving drilling success rates and lowering overall development costs. Currently, the lack of geophysical methods and technologies to reliably image these features makes exploration and development of geothermal systems particularly challenging and costly. The ultimate goal of this effort will be to develop methods that reduce the total

number of wells that are needed to locate and confirm hidden geothermal resources (see proposal requirements below).

GTO is interested in projects that will:

- Reduce the cost and risk to future exploration drilling efforts through the provision of high-resolution subsurface imagery at locations in certain promising geothermal settings. Imaging techniques involving the integration of multiple geophysical data types are also allowed but not required.
- Advance the state of the art in tools and techniques for accomplishing the same;
- Build on recent GTO-funded work to improve the understanding of heat source and occurrence for certain hidden play types that have not yet been demonstrated in the U.S.; and
- Where possible, support the estimation of resource size to aid in prioritizing and justifying further exploration investments.

DOE EERE FY 2020 Geothermal Technologies Office Hydrothermal and Low Temperature Multi-Topic Funding Opportunity Announcement; FOA # DE-FOA-0002219 [2.4.20]

FOA Issue Date: February 4, 2020
Submission Deadline for Letter of Intent: March 2, 2020
Submission Deadline for Full Applications: April 8, 2020
Expected Submission Deadline for Replies to Reviewer Comments: May 27, 2020
Expected Data for EERE Selection Notifications: July 2020
Expected Timeframe for Award Negotiations: September 2020

Background and Purpose
The Geothermal Technologies Office (GTO), within the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE), supports early-stage research and development (R&D) to strengthen the body of knowledge upon which industry can accelerate the development and deployment of innovative geothermal energy technologies.

GTO works to develop technologies to drive down the costs and risks of geothermal energy. Geothermal energy is a domestic energy resource from the heat of the earth, which represents a reliable, secure, clean, and nearly inexhaustible energy source.

This multi-topic funding opportunity aims to drive down costs and risks associated with the discovery of hidden geothermal systems in the Basin & Range region of the U.S., and to enhance energy system resilience through the utilization of Reservoir Thermal Energy Storage (RTES), Deep Direct-Use (DDU) and other geothermal direct use applications on military installations, hospital complexes, and other large energy end-uses across the U.S. such as university campuses.

DOE American-Made Challenges: Geothermal Manufacturing Prize [1.29.20]

Prize Announced: January 29, 2020
Contest Open For Submissions: April 20, 2020
Submission Deadline: July 20, 2020
Contest Winners Announced: September 30, 2020
Total Award Amount Available: $3.25 Million

The U.S. Department of Energy (DOE) announced $3.25 million for the American-Made Geothermal Manufacturing Prize. A first-of-its-kind for geothermal technology, this prize is designed to spur innovation and address manufacturing challenges fundamental to operating in harsh geothermal environments. This prize further supports

the ability of the geothermal industry to reach the target of 60 Gigawatts electric of geothermal capacity by 2050 as outlined in the recently released GeoVision study.

“Additive manufacturing is such a promising technology for so many industries, and this American-Made prize will help ensure that, through innovation, the American geothermal industry will continue to lead the world,” said U.S. Secretary of Energy Dan Brouillette. “By creating incentives for new approaches to device design, this prize will help unlock the full potential of geothermal power as a clean, reliable, affordable energy source for American homes and businesses.”

As part of the American-Made Challenges series, the Geothermal Prize unites the world’s best-in-class research base with the unparalleled entrepreneurial support system of the American-Made Network. Consisting of pioneering maker spaces, dozens of energy incubators, universities, and 17 DOE National Laboratories, the network is primed to create a sweeping portfolio of innovations to demonstrate the promise of additive manufacturing.

The Geothermal Prize is a series of four progressive competitions that harness the rapid advances that additive manufacturing can provide in tool design, fabrication, and functionality. It incentivizes innovators and entrepreneurs to discover new advanced manufacturing solutions. This rapid, scalable approach to prototype development not only provides cash prizes, but also engages America’s unique innovation ecosystem to help participants achieve their goals. Eligible competitors include entrepreneurs, members of a team working within a company, university students and faculty, small business owners, researchers at DOE National Laboratories, or anyone based in the U.S. that has the desire to bring an impactful solution in this area to reality. Participants will compete for cash prizes, as well as vouchers to leverage the capabilities and expertise of the American-Made Network. The combination of funding with the mentoring, training, and other services from the American-Made Network supports long-term success for participants and growth in U.S. manufacturing.

The Geothermal Prize is led by the DOE’s Office of Energy Efficiency and Renewable Energy’s Geothermal Technologies Office and Advanced Manufacturing Office, and is administered by the National Renewable Energy Laboratory in partnership with Oak Ridge National Laboratory on the American-Made Challenges platform.

Please visit HERE for more information, including preliminary rules and how to get involved.

DOE American-Made Challenges: Water Resource Recovery Prize [1.29.20]

Phase 1 Submissions Open: January 29, 2020
Phase 1 Submissions Close: April 28, 2020
Phase 2 Submissions Open: May 2020
Phase 2 Submissions Close: May 2021
Phase 2 Winners Announced: June 2021
Total Award Amount Available: $1 Million

Through this prize competition, DOE is seeking novel, systems-based solutions from multidisciplinary teams to implement resource recovery at small- to medium-sized water resource recovery facilities (WRRFs).

By presenting cost-effective and innovative facility engineering solutions, WRRFs can progress toward the goal of doubling resource recovery and accelerate the transition from conventional wastewater treatment to a model of resource recovery from municipal wastewater across the United States.

Applications for participation will be evaluated on demonstrated achievement of target recovery levels, with additional credit being given for innovation and replicability. Beyond the cash prize, winners may be recognized by having their plans published on a public-facing website to provide potential wastewater treatment recovery strategies that other wastewater treatment facilities might adopt.

Who can participate?
Small- to medium-sized WRRFs (defined by DOE as those facilities treating no more than 50 million gallons per day, based on a calendar year average), technology developers, resource customers (e.g., farmers, electric and gas

utilities), academic researchers, regulators, business/financial interests, local governments and non-profit organizations are all welcome and encouraged to compete. However, DOE expects that at least one WRRF will be a part of any successful submission.

EDA OIE 2020 Build to Scale (B2S) Program; FOA # EDA-HDQ-OIE-2020 [2.18.20]

FOA Issue Date: February 18, 2020
Submission Deadline for Full Applications: March 24, 2020
Estimated Total Program Funding: $35,000,000

Description
EDA's Office of Innovation & Entrepreneurship is committed to furthering technology-based economic development initiatives that accelerate high quality job growth, create more economic opportunities, and support the future of the next generation of industry leading companies. To advance these goals, EDA awards grants through the Build to Scale Program (formerly the Regional Innovation Strategies Program) for activities designed to develop and support regional innovation initiatives.[1] EDA thereby advances the growth of connected, innovation-centric economies that increase job growth, enable the workforce of tomorrow, enhance global competitiveness, and foster global competitiveness through technology commercialization and entrepreneurship as described in Stevenson-Wydler Technology Innovation Act of 1980 (hereafter "Section 27").

The Build to Scale Program invites organizations who are aiding companies in developing the next generation of technologies to apply for funding. These organizations may be operating initiatives to unlock investment capital across a region or sector, operating programs to accelerate company growth, empowering the next generation of entrepreneurs, and/or enabling technology commercialization.

Under the Build to Scale Program, EDA is soliciting applications for three separate competitions:

1. The Venture Challenge
2. The Capital Challenge
3. The Industry Challenge

Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative: Federal Fiscal Year 2020 – Request for Proposals (RFP) for Project Grants [12.9.19]

RFP Release Date: December 9, 2019
Application Portal Opens: January 13, 2020
Letter of Intent Due: February 28, 2020 at 5:00 PM ET
Proposal Due Date: March 27, 2020 at 5:00 PM ET

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 2020 (FY20) funding.

The POWER Initiative makes available 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 reemployment opportunities, creating jobs in existing or new industries, and attracting new sources of investment.

This RFP provides a general overview of the POWER Initiative, as well as the specific

requirements needed to complete a POWER FY20 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 www.arc.gov/POWER.

Advanced Research Projects Agency – Energy (ARPA-E) Performance-Based Energy Resource Feedback, Optimization, and Risk Management [9.19.19]

Funding Opportunity Announcement (FOA) Issue Date: September 19, 2019
First Deadline for Questions to ARPA-E-CO@hq.doe.gov: 5 PM ET, October 18, 2019
Submission Deadline for Concept Papers: 9:30 AM ET, October 28, 2019
Second Deadline for Questions to ARPA-E-CO@hq.doe.gov: 5 PM ET, TBD
Submission Deadline for Full Applications: 9:30 AM ET, TBD
Submission Deadline for Replies to Reviewer Comments: 5 PM ET, TBD
Expected Date for Selection Notifications: TBD
Total Amount to Be Awarded Approximately $30 million, subject to the availability of appropriated funds.
Anticipated Awards ARPA-E may issue one, multiple, or no awards under this FOA. Awards may vary between $250,000 and $10 million.

Program Description:

Optimal utilization of all grid assets requires a fundamental shift in grid management rooted in an understanding of asset risk and system risk. Existing management practices were designed for a grid consisting of and fully reliant on conventional generation assets. Present operational and planning practices do not acknowledge or leverage the true capabilities and associated challenges of emerging assets. A novel risk-driven paradigm will allow emerging assets to be trusted and relied upon to provide the critical products and services necessary to maintain an efficient and reliable grid, thereby breaking the persistent reliance on conventional generation technologies.

PERFORM seeks to develop innovative management systems that represent the relative delivery risk of each asset and balance the collective risk of all assets across the grid. A risk-driven paradigm allows operators to: (i) fully understand the true likelihood of maintaining a supply-demand balance and system reliability, (ii) optimally manage the system, and (iii) assess the true value of essential reliability services. This paradigm shift is critical for all power systems and is essential for grids with high levels of stochastic resources. Projects will propose methods to quantify and manage risk at the asset level and at the system level.

Innovation Need:

Affordable and reliable electricity is a fundamental component for any advanced society. There is a strong correlation of a country's gross domestic product (GDP) with its electric energy consumption. And the pursuit to electrify energy services for transportation, buildings, and various industrial sectors only adds to the importance of the electric power sector.

Today's grid relies on conventional, bulk power plants to provide the essential flexibility to operate power systems reliably. These assets are dispatchable and can guarantee their available capacity, except in rare events. The existing risk management strategy is to protect against those rare events: the sudden loss of a single bulk asset. Existing risk management practices align well with conventional technologies but must be reassessed due to the impending dramatic shift in resource mix, including the increase in intermittent renewable resources and storage technologies. As emerging technologies are increasingly deployed, management systems must evolve to leverage all capabilities of these emerging assets to maintain an economical and reliable grid.

Potential Impact:

PERFORM projects will design a risk score that clearly communicates the physical delivery risk of an asset's offer and design grid management systems that endogenously capture uncertainty and evaluate and hedge the system risk position to meet or exceed a baseline system risk index. This pursuit will achieve the following area impacts.

Security:

Optimal utilization of renewable and clean resources for all grid services: (i) improves grid reliability, (ii) reduces energy imports, and (iii) provides a sustainable path to energy independence.

Environment:

When low- or zero-emission assets provide all grid products and services, grid operations are no longer reliant on legacy, carbon-heavy centralized generation assets, which enables the grid to absorb more clean resources.

Economy:

Modernization of risk management practices is a viable and cost-effective way to reduce costs to consumers while achieving a clean and sustainable electric power sector. Novel risk management strategies will also enhance the value proposition of emerging technologies, including renewable resources and storage. This pursuit merges risk techniques of the electric power sector with the finance and actuarial science communities, thereby enabling further economic growth and opportunities as well as redefining the future role of electric power sector entities.

Planning and Operation Models and Data Analytics for Solar Grid Integration; RFI # DE-FOA-0002157 [7.26.19]

RFI Issue Date: July 26, 2019
Submission Deadline for RFI: August 30, 2019

Description:

The U.S. Department of Energy Solar Energy Technologies Office (SETO) is issuing this request for information (RFI) to inform strategies relating to the modeling, monitoring, predicting, and controlling of solar photovoltaic (PV) systems. As the penetration of solar PV on the grid grows, these activities will become more important as grid operators consider how solar adoption impacts grid planning and operations technologies.

SETO is seeking information from industry, academia, research laboratories, government agencies, and other stakeholders.

Purpose:
The purpose of this RFI is to solicit feedback to inform SETO's strategic planning on research related to the integration of distributed solar energy resources.

SETO will not provide funding or compensation for any information submitted in response to this RFI and SETO may use information submitted to this RFI without any attribution to the source. This RFI provides the broad research community with an opportunity to contribute views and opinions regarding planning and strategy development.

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: May 7, 2019
Submission Deadline for Concept Papers: June 20, 2019
Submission Deadline for Full Applications: August 29, 2019
Expected Submission Deadline for Replies to Reviewer Comments: October 16, 2019
Expected Date for EERE Selection Notification: 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 : https://doe.webex.com/doe/onstage/g.php?MTID=e0e763aac7daf6b2464e74ca4aebca3a3	5/13/2019 1:30 pm ET
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.

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

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

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.

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

Solicitation Issue Date: March 28, 2019
Submission Deadline for Proposals: May 22, 2019
Selection Date: Mid-July
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).

PHOTOVOLTAICS (PV)

Single-Year Projects on Breakthrough PV Cell and Module Concepts

This topic will support high-risk, breakthrough ideas that, if successful, would create disruptive PV cell and/or module technology and enable major levelized 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.

CONCENTRATING SOLAR-THERMAL POWER (CSP)

Single-Year Projects Developing Novel CSP Concepts

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).

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
Submission Deadline for Concept Papers: May 14, 2019
Submission Deadline for Full Applications and SIPS Applications: July 25, 2019
Expected Submission Deadline for Replies to Reviewer Comments: September 6, 2019
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/selectee be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancelation of further award negotiations and rescission of the selection.

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.

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.

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

Request for Applications (RFA) Opens: December 20, 2018
Deadline for Applications: January 8, 2019
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.

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/

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
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
Application Deadline: October 25, 2018

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.

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

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.

DOE EERE SETO American-Made Solar Prize [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://atrnsuf.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 CO_2 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 (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.

DOE EERE GTO Geothermal Deep Direct-Use Feasibility Studies Funding Opportunity Announcement; FOA # DE-FOA-0001601 [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.

DOE EERE BTO Scaling Up the Next Generation of Building Efficiency Packages; FOA # DE-FOA-0001518 [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.

NSF Smart and Connected Communities [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.gov/pubs/2016/nsf16610/nsf16610.htm

DOE OE Sensor and Modeling Approaches for Enhanced Observability and Controllability of Power Systems with Distributed Energy Resources (DERs); FOA # DE-FOA-0001616 [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.