DEPARTMENT OF ENERGY (DOE)
OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY (EERE)

SUSTAINABLE AND HOLISTIC INTEGRATION OF ENERGY STORAGE AND SOLAR PV (SHINES)

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001108
FOA Type: Modification 0002
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FOA Issue Date:	October 28, 2014
Modification No. 0001 Issue Date:	January 26, 2015
Modification No. 0002 Issue Date:	March 9, 2015
Informational Webinar:	November 13, 2014
Submission Deadline for Concept Papers:	December 16, 2014 5:00pm ET
Submission Deadline for Full Applications:	March 26, 2015 5:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	May 15, 2015 5:00pm ET
Expected Date for EERE Selection Notifications:	June 22, 2015
Expected Timeframe for Award Negotiations	60 days

- Applicants must submit a Concept Paper by 5:00pm ET on the due date listed above to be eligible to submit a Full Application.

- To apply to this FOA, Applicants must register with and submit application materials through EERE Exchange at https://eere-Exchange.energy.gov, EERE's online application portal. Frequently asked questions for this FOA and the EERE Application process can be found at https://eere-exchange.energy.gov/FAQ.aspx.

- 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.

Note: Effective 12/26/2014, the DOE Financial Assistance regulations contained in 10 CFR 600 will be superseded by the Financial Assistance regulations contained in 2 CFR 200 (codified in Part IX of 2 CFR).
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MODIFICATIONS

All modifications to the Funding Opportunity Announcement are highlighted in yellow in the body of the FOA.

Mod. No.	Date	Description of Modifications
0001	January 26, 2015	1. Extend the Submission Deadline for Full Applications from March 19, 2015 to March 26, 2015 5:00pm (ET).
0002	March 9, 2015	2. Revise Section II.B.2. Funding Agreements with FFRDCs, GOGOs, Federal Agencies and Federal Instrumentalities; and 3. Revise Section III.E.2. Requirements for DOE/NNSA and non-DOE/NNSA Federally Funded Research and Development Centers Included as a Subrecipient.

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EXECUTIVE SUMMARY

Means of Submission	Concept Papers, Full Applications, and Replies to Reviewer Comments must be submitted through EERE Exchange at https://eere-Exchange.energy.gov, EERE's online application portal. EERE will not review or consider applications submitted through other means. The Users' Guide for Applying to the Department of Energy EERE Funding Opportunity Announcements is found at https://eere-Exchange.energy.gov/Manuals.aspx.
Total Amount to be Awarded	$ 15,000,000
Average Award Amount	EERE anticipates making awards that range from $500,000 to $5,000,000.
Types of Funding Agreements	Cooperative Agreements, Grants, Technology Investment Agreements, Work Authorizations, and Interagency Agreements
Period of Performance	24 to 36 months
Eligible Applicants	Individuals, Domestic Entities, Foreign Entities, Incorporated Consortia, Unincorporated Consortia, subject to the definitions in Section III.A.
Cost Share Requirement	50% of Total Project Costs
Submission of Multiple Applications	Applicants may submit more than one application to this FOA, provided that each application describes a unique, scientifically distinct project.
Application Forms	Required forms and templates for Full Applications are available on EERE Exchange at https://eere-Exchange.energy.gov.
FOA Summary	With the anticipated proliferation of solar power at the central and distributed scales, the variability and uncertainty of the solar resource poses challenges for reliably integrating photovoltaics (PV) with electric power systems, both at the distribution and bulk system levels. The goal of the Department of Energy, EERE, SHINES Funding Opportunity is to enable holistic design, development, and widespread sustainable deployment of low-cost, flexible, and reliable solutions that have energy storage as one of the key components, for successful integration of PV power plants.

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I. FUNDING OPPORTUNITY DESCRIPTION

A. OBJECTIVES

The SunShot Initiative (SunShot) is a national collaborative effort to make solar energy cost-competitive with other forms of electricity by the end of the decade. The installed cost of solar photovoltaics (PV) has reduced significantly in recent years, spurring significant and accelerating deployment of PV systems.

With the anticipated proliferation of solar power at the centralized and distributed scales, the variability and uncertainty of the solar resource poses challenges for reliably integrating photovoltaics (PV) with electric power systems, both at the distribution and bulk system levels.

The goal of the Department of Energy, EERE, SHINES Funding Opportunity is to enable the development and demonstration of integrated, scalable, and cost-effective technologies for solar that incorporates energy storage and works seamlessly to meet both consumer needs and the needs of the electricity grid. Such an integrated solution should utilize smart inverters, and be capable of working with smart buildings, smart appliances, and utility communication and control systems. The solutions thus developed will enable widespread sustainable deployment of low-cost, flexible, and reliable PV generation, and provide for successful integration of PV power plants with the electric grid.

B. BACKGROUND

To achieve the SunShot Initiative goals, the Systems Integration sub-program within SunShot works to enable widespread deployment of safe, reliable, and cost effective solar energy on the nation's electricity grid by addressing the associated technical and regulatory challenges. As more solar power plants come online, timely and cost-effective interconnections, accurate prediction, monitoring and control of solar power, impacts on the performance and reliability of transmission and distribution power grids due to power flows from customer-sited solar generation, and maintaining reliability of the grid are becoming a larger challenge requiring innovation to bring down cost.

To proactively anticipate and address potential challenges under a scenario in which hundreds of gigawatts (GW) of solar energy are interconnected to the electricity grid, the Systems Integration sub-program has identified the challenges to be addressed in four broad, inter-related areas, as depicted in Figure 1, and described below:

- ***Grid Performance and Reliability***: Maintain and enhance the efficiency and reliability of electricity transmission and distribution grids in a cost-effective, safe manner with hundreds of gigawatts of solar generation deployed onto the nation's power system.

- ***Dispatchability***: Ensure that solar power is available on-demand, when and where it is needed and at the desired amounts, in a manner that is comparable to or better than conventional power plants.

- ***Power Electronics***: Develop intelligent devices that maximize the power output from solar power plants and interface with the electric grid (or end use circuits), while ensuring overall system performance, safety, reliability, and controllability at minimum cost.

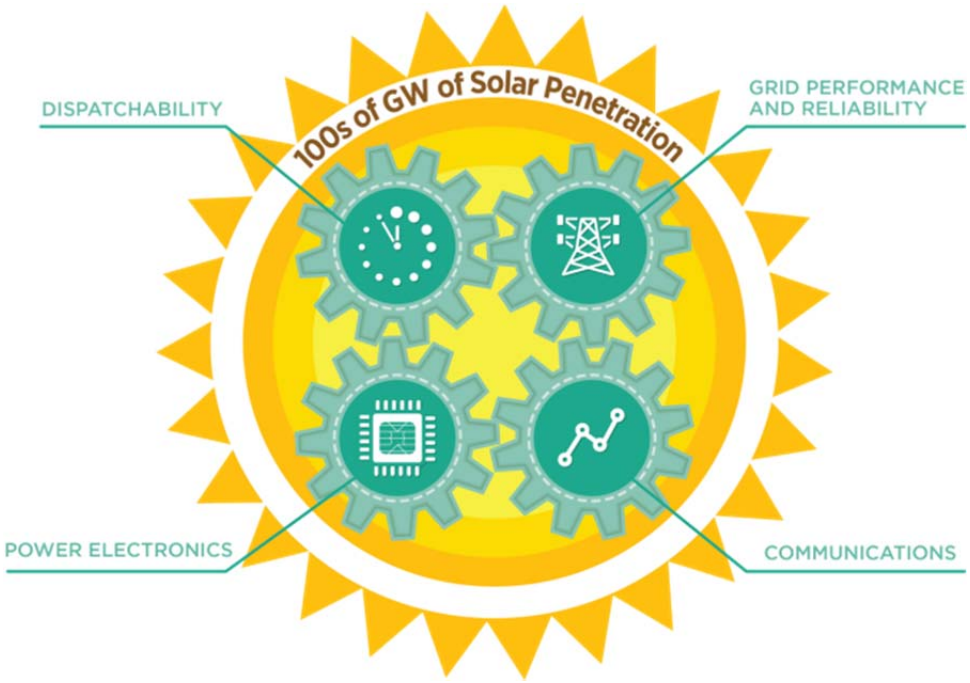

Figure 1: SunShot Systems Integration Activity Areas

- ***Communications***: Create infrastructure that is used to inform, monitor, and control generation, transmission, distribution and consumption of solar energy effectively under broad temporal and spatial scales.

Achieving the SHINES goal is a critical step in the pathway towards enabling hundreds of GW of solar to be integrated reliably and cost-effectively onto the electric grid. The challenges and opportunities for high penetration of solar on the nation's electricity grid are discussed in the sections below.

Transmission Grid Impacts of High Solar Penetration

At the bulk system level, high penetration of solar has impacts on *generation* – equivalently, the *net load* – and the *capacity value of solar*. Figure 2 shows simulation results for the generation dispatch stack at a certain location for a spring day in a future year, to supply load under 0%, 2%, 6%, and 10% solar PV penetration. Each block represents the impact of increasing penetration of solar generation, for the same 24 hour period on a spring day, a period of time modeled to highlight the potential impact of excess generation. Regional differences in generation mix and load profiles will yield different results. Figure 2 should be considered illustrative of what could happen if markets and technologies are not prepared for higher solar penetration.

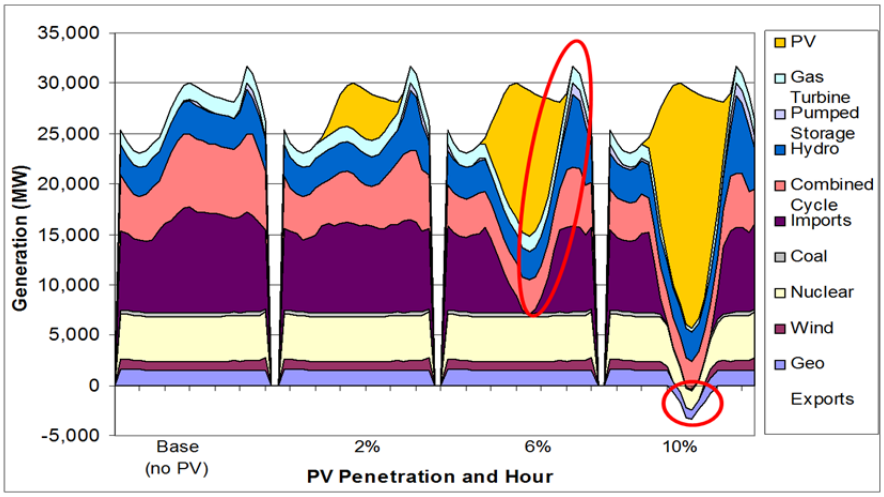

Figure 2: Simulated dispatch in California for a spring day in a future year with varying PV penetration. [1]

As shown in Figure 2, the high penetration and the *availability* of solar energy only during the daytime, results in steep reductions required from other types of generation using fuels such as natural gas and possibly nuclear if load profiles are unchanged. Specifically, a steep downward ramp is required during mid-morning hours to accommodate the large and rapid increase in solar generation, and a correspondingly steep upward ramp – by some estimates, up to 13,000 MW in 3 hrs[2] – is required during late afternoon hours to accommodate the large and rapid decrease in solar generation. These ramp requirements from conventional generation are atypical and can be potentially difficult and expensive to accommodate in order to incorporate high solar penetration. Further, challenges arise for the system operator to properly determine the appropriate levels of dispatch for all conventional generation, with the uncertainty in the magnitude and timing associated with the ramps required due to high solar penetration since solar irradiance and power output is a quantity that needs to be predicted rather than determined in advance.

Capacity value for generators can be understood in terms of demand charge for loads – while demand charges are paid by the loads based on their peak demand, capacity value is a revenue source that is meant to compensate the generators for providing the option to supply power when needed. Figure 3 summarizes results from various studies that uniformly show a decreasing value for capacity credit for solar, with increasing PV penetration.

Since solar energy is presently considered to be non-dispatchable, as the amount of solar generation available within a fixed timeframe increases, the value of that solar generation reduces due to oversupply. The reduction in this revenue source potentially reduces the incentive to install solar power plants, which is a challenge to be addressed in order to enable high penetration of solar and the related benefits.

[1] P. Denholm and M. Mehos, "Enabling Greater Penetration of Solar Power via the Use of CSP with Thermal Energy Storage," 28 pp. NREL Report No. TP-6A20-52978, 2011. http://www.nrel.gov/docs/fy12osti/52978.pdf

[2] *http://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf* (Accessed: October 2014)

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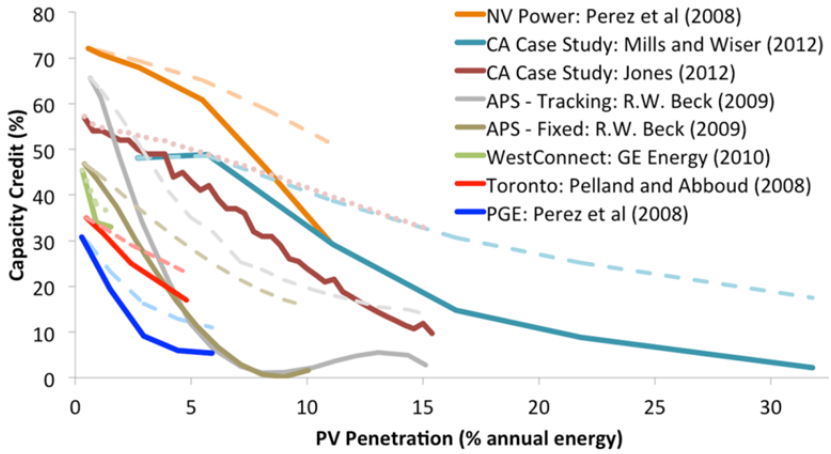

Figure 3: Capacity value of PV as estimated by various studies[3]

Distribution Grid Impacts of High Solar Penetration

Historically, the power grid, especially the distribution system, has been designed and optimized for power flow in one direction: from central generators to substations through the transmission network, and then through feeders to individual consumers. As penetration of distributed solar generators, such as rooftop PV solar panels, increases, it is envisioned that during some hours of the day, the power generated by the solar installation can exceed power consumption needs, and therefore, power flow will be in the "reverse direction," from individual consumers through the feeders to the substation and possibly beyond, into the bulk power system. This can be especially true for residential customers who are not at home during the workday.

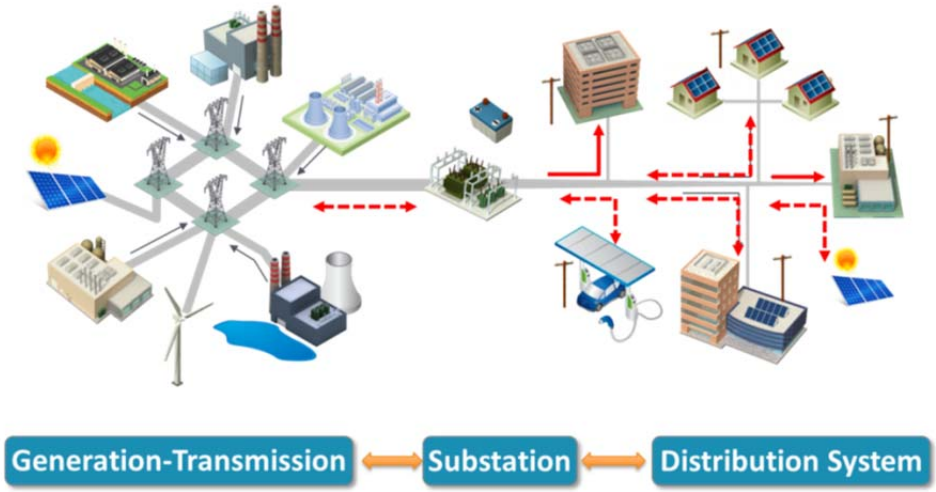

Figure 4: Two-way coupled Transmission and Distribution grid

[3] A. Mills and R. Wiser, "Solar Valuation in Utility Planning Studies," Presentation by Lawrence Berkeley National Laboratory, 2013 *http://emp.lbl.gov/sites/all/files/LBNL-Solar_Valuation_CESA.pdf* (Accessed: October 2014)

The reverse power flows shown conceptually in Figure 4 poses unique challenges in operating the distribution grid in a reliable manner. One challenge is reconfiguring protection equipment such as relays to handle power flows in both directions and still trip for system faults in the expected manner, without false positives (nuisance or sympathetic trips) or false negatives. Reconfiguring protection systems adds cost and technical complexity due to the unpredictable and varying nature of bi-directional power flow from intermittent renewables such as solar power. Another key challenge is the variability (Figure 5) of solar power that could cause feeder and substation voltage variations in both temporal and spatial patterns that are very different from historical values. Such voltage variations can cause system voltages at certain locations with PV to exceed ANSI limits depending on feeder conditions (such as load levels) and distance from the substation, and in the extreme cases, cause damage and premature failure of distribution system equipment such as tap changers and static compensators.

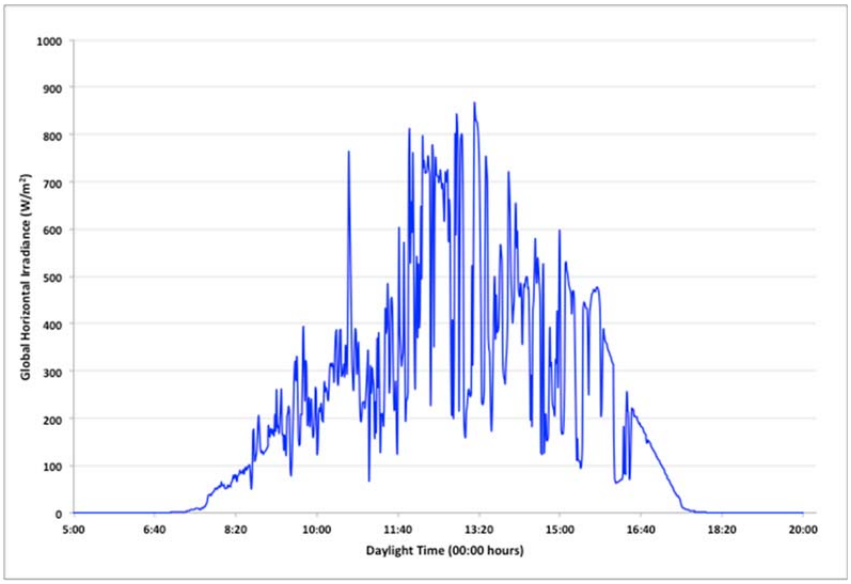

Figure 5: Illustrative variability in solar power output based on measured 1-minute irradiance data[4]

SunShot Investments in Addressing Solar Grid Integration Challenges

To address the challenges associated with high penetration of solar onto the grid, DOE-SunShot has historically funded programs addressing various aspects of solar systems integration RD&D. For example, the Solar Energy Grid Integration Systems – Advanced Concepts (SEGIS-AC) program (http://energy.gov/eere/sunshot/solar-energy-grid-integration-systems-advanced-concepts) seeks to develop solar power electronics that incorporate advanced functionality for enabling high penetrations of PV. The High Penetration Solar Deployment program (http://energy.gov/eere/sunshot/high-penetration-solar-deployment) seeks to model, test, and evaluate solutions to mitigate the impacts of high penetrations of PV on distribution systems. The Improving Accuracy of Solar Forecasting (http://energy.gov/eere/sunshot/solar-forecasting) program seeks to develop, validate, and implement accurate forecasts of future solar energy

[4] Redrawn with data from NREL

production across a range of temporal and spatial scales. The Solar Utility Networks: Replicable Innovations in Solar Energy (SUNRISE) program (http://energy.gov/eere/sunshot/solar-utility-networks-replicable-innovations-solar-energy) seeks to incorporate solar energy into long-term utility strategic planning and to develop operational strategies for power systems with high penetrations of PV. In addition, SunShot has funded studies (http://energy.gov/eere/sunshot/systems-integration-research-development-and-demonstration) at national laboratories such as the National Renewable Energy Laboratory (NREL) and Sandia National Laboratory (SNL), to understand the impact of high penetration of solar generation both at bulk power and at distribution system levels.

It is evident that almost all of the impacts of solar power on the transmission and distribution grids are fundamentally due to two key characteristics namely, *constrained solar availability*—the fact that the solar energy is available only during daytime, with the highest amounts of energy primarily from mid-morning till late afternoon whereas for a typical load profile in a residential or commercial installation, demand increases during early morning, levels off during the day, increases during early evening and tapers off later in the night—and *variability* in solar power that is due to changes in solar irradiance and cloud transients. As penetration of solar increases, it is imperative that these two attributes are handled in a fashion that maintains grid reliability, resiliency, and power quality while minimizing curtailment of available solar power and enabling sustainable performance, economic, and societal benefits of solar integration on the electricity grid.

It is envisioned that the *Sustainable and Holistic IntegratioN of Energy Storage and Solar PV*—**SHINES**—solutions created through this funding opportunity will systematically address the challenges, outlined in this section and further elaborated in the next section, and enable dramatically increased dispatchable solar penetration, to position the industry on a pathway that enables hundreds of GW of solar to be connected to the electricity grid. The widespread adoption of such solutions will be a transformative influence on the current state of the art of solar grid integration, and will significantly contribute to an economically viable pathway toward energy efficient and sustainable integration of solar generation at much higher penetration levels than currently possible today. The areas of interest and the expectations of the FOA are further discussed in the sections that follow.

As penetration of solar on the grid increases (eventually approaching hundreds of GW of interconnected capacity), a variety of approaches need to be considered and implemented at varying scale, for reliable and cost-effective integration into the grid. As an example, one approach shows recent analyses results[5] from Lawrence Berkeley National Laboratory (LBNL), on the value of PV at higher penetrations when low-cost energy storage is installed.

As shown in that analysis, energy storage could increase the value of PV, especially at higher penetrations that are envisioned in the SunShot Initiative at DOE. The key attribute in this study for energy storage, is that of supply shifting to ensure that the available solar power is distributed

[5] A. Mills and R. Wiser, "Strategies for Mitigating the Reduction in Economic Value of Variable Generation with Increasing Penetration Levels", LBNL Report LBNL-6590E, March 2014; *http://emp.lbl.gov/sites/all/files/lbnl-6590e.pdf*.

across the day, and reducing the variability of solar power, thus enabling more solar generation to be integrated onto the grid with reduced curtailment. It is to be noted that while the LBNL study assumed a low cost of storage (primarily pumped hydro storage at $ 140 /kW-year) and storage capacity at bulk-power scale, the results from this study do indicate value propositions for storage under high solar penetration scenarios.

C. TECHNICAL AREA OF INTEREST

Recent workshops including the one held by SunShot in Berkeley, CA on January 13, 2014 and at the SunShot Grand Challenge Summit in May 2014 identified the following technology challenges and gaps pertinent to the SHINES vision:

1) Leadership in developing and demonstrating integrated solutions for solar that includes energy storage and will be applicable at greatly increased penetration levels;
2) Standardized interoperability and communication between various components in the integrated solution, and with external systems such as utility grid management software;
3) Understanding various levels of controls, such as local vs regional vs global, and choosing optimization parameters such as timescale, grid characteristics, building load profile of solar and storage systems, and their impact and value.

Figure 6 shows an illustrative solution set of potential pathways for handling high solar penetration, which includes forecasting, supply shifting, load shifting and energy storage among others. As solar penetration on the grid increases eventually well into the envisioned hundreds of GW of interconnected capacity, all of the approaches suggested in Figure 6 need to be considered in concert and implemented at varying scale, for reliable and cost-effective integration into the grid.

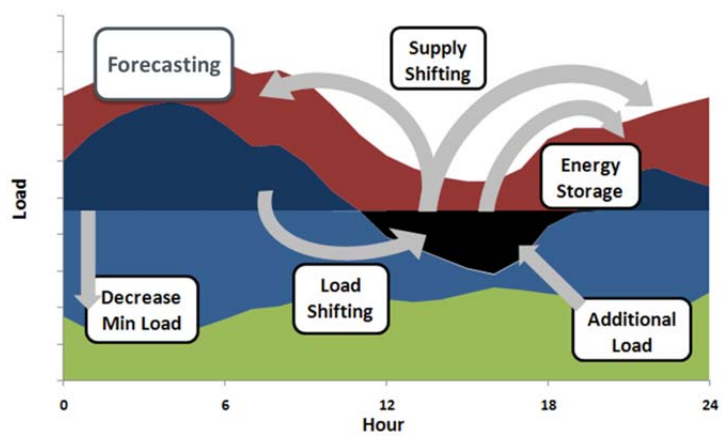

Figure 6: Solutions to maintain grid reliability and minimize solar curtailment under high solar penetration[6]

[6] P. Denholm, E. Ela, B. Kirby and M. Milligan, "Role of Energy Storage with Renewable Electricity Generation," 61 pp., NREL Report NREL/TP-6A2-47187, 2010. http://www.nrel.gov/docs/fy10osti/47187.pdf.

The SHINES Solution

The SHINES solution as envisioned by SunShot will have the following features:

- be grid-connected,
- consist of the solar PV plant and energy storage,
- utilize smart inverters,
- be capable of operating in conjunction with smart loads (such as optimized operation of HVAC systems and other appliances),
- enable demand response,
- incorporate solar and load forecasting into decisions; and
- be interoperable internally and externally using standard protocols that satisfy communication and control capabilities as required by the local utility, home/building energy management systems, and/or the building/community where it is installed.

Such an integrated solution as depicted in Figure 7 should be scalable to significantly higher levels of penetration with standardized and proven external and internal interoperability capabilities. The SHINES solution thus developed is expected to have minimal interconnection review and approval process by the utility due to the standard nature of capabilities, communication, control and data exchange attributes, and is also expected to facilitate the determination of the optimal distribution circuit upgrades by the utility and the needed modifications to behavior of loads for enabling high penetrations of solar.

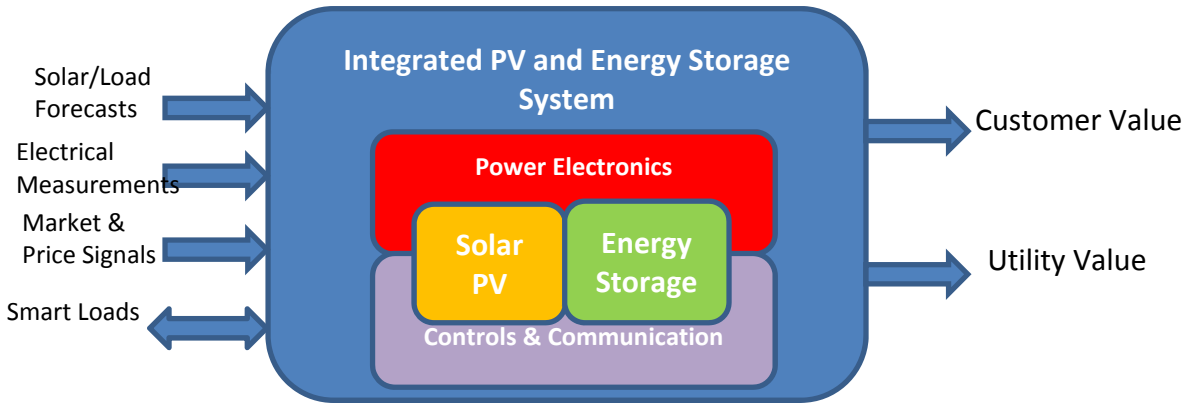

Figure 7: Schematic representation of the SHINES solution

Referring to the set of solutions that were shown in Figure 7, this concept of how the SHINES solution addresses all of the potential approaches for mitigating impacts due to high penetration of solar is shown schematically in Figure 8.

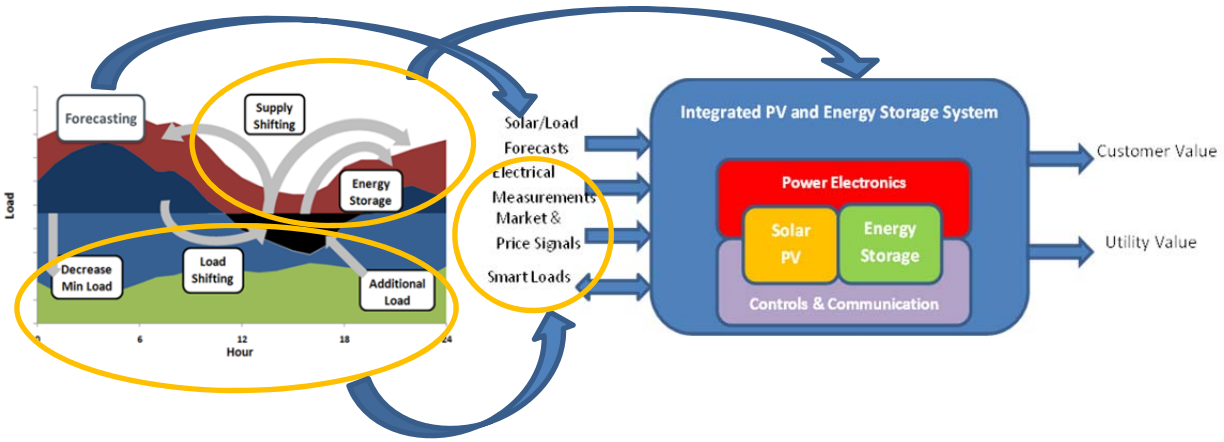

Figure 8: Holistic approach by the SHINES solution to enable high penetration of solar

In keeping with the long term SunShot vision of enabling sustainable and holistic integration of hundreds of GW of solar generation into the power grid, the specific goal of this FOA is to fund projects that will design, develop, deploy, and demonstrate SHINES solutions that include both hardware and soft/firmware with the attributes specified in the next section.

Attributes of the SHINES Solutions

It is envisioned that energy storage will be an integral part of SHINES solutions, to perform two functions: (1) identify and store solar generation in excess of local load during high supply and low usage periods, and release the stored energy during peak load hours when the power from solar plants are reduced, providing supply shifting on a daily basis, and (2) decrease the variability of solar power output, provides a robust and sustainable path in mitigating potential adverse impacts of high solar penetration. Studies[7,8] have shown that energy storage could increase the value of PV especially at the higher penetrations that are envisioned by the SunShot Initiative.

High Power and High Energy Requirement: A variety of energy storage systems are available as shown in Figure 9 that are suitable for different applications, of which batteries are the most common energy storage device suitable for applications that require high power or high energy. *A key challenge for energy storage systems to assist in renewable integration is the requirement for BOTH high power and high energy delivery*. High power requirement stems from the fact that power output from solar plants can spike up or down extremely fast, requiring a compensating mechanism to absorb such fluctuations on charge as well as discharge. High energy delivery is needed to perform "supply shifting," i.e., store excess solar energy during the day, and utilize it during other hours when electricity is needed.

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[7] A. Mills and R. Wiser, "Strategies for Mitigating the Reduction in Economic Value of Variable Generation with Increasing Penetration Levels", LBNL Report LBNL-6590E, March 2014; *http://emp.lbl.gov/sites/all/files/lbnl-6590e.pdf*.

[8] P. Denholm and M. Hand, "Grid flexibility and storage required to achieve very high penetration of variable renewable electricity," *Energy Policy*, Vol. 39, No. 3, pp. 1817–1830, 2011; *http://dx.doi.org/10.1016/j.enpol.2011.01.019*.

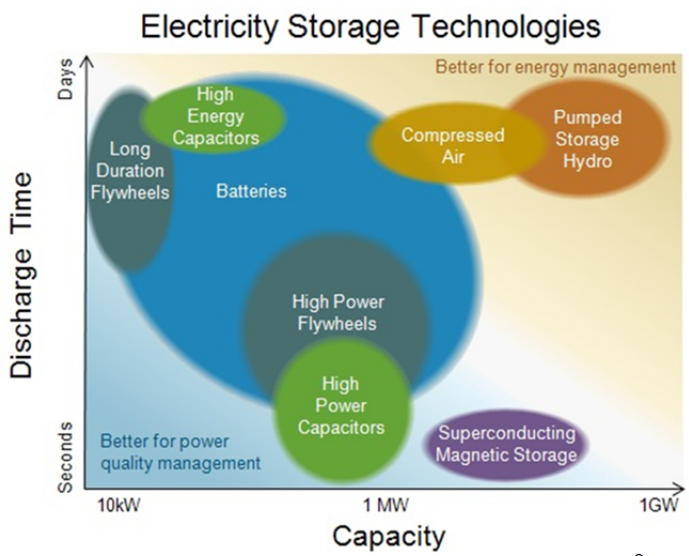

Figure 9: Energy storage technologies and applications[9]

Therefore, while investigating various energy storage devices for their suitability for the SHINES solution, both the high power and high energy requirement should be considered.

System Performance: Further, the energy storage equipment should be designed to incorporate the specific behavior of PV plants, and in combination with the PV plants, should form an integrated solution that provides a smooth power output from solar plants, and stores excess solar energy during the day or from other sources during the night, and provides that stored energy during the morning and evening hours to mitigate the potentially steep ramps in solar power output and load. As shown conceptually in Figure 10, the energy storage function of the SHINES solution should result in two cycles per day (A cycle is defined as one charge and one discharge). During these 2 cycles per day, a Depth of Discharge (DoD) of 100% should be achieved within 1 hour or less. It is expected that the energy storage system should be able to operate at rated power for at least 4 hours with less than 5% internal energy loss in a fully charged state. Regional differences (including weather, load profiles, and generation mix) may necessitate solutions that are tailored for the specific requirements of the PV site. A SHINES solution should be adaptable and be able to incorporate modular and scalable energy storage systems.

[9] "Electricity storage technologies can be used for energy management and power quality," U.S. Energy Information Administration (EIA), 2011, *http://www.eia.gov/todayinenergy/detail.cfm?id=4310* (Accessed: October 2014)

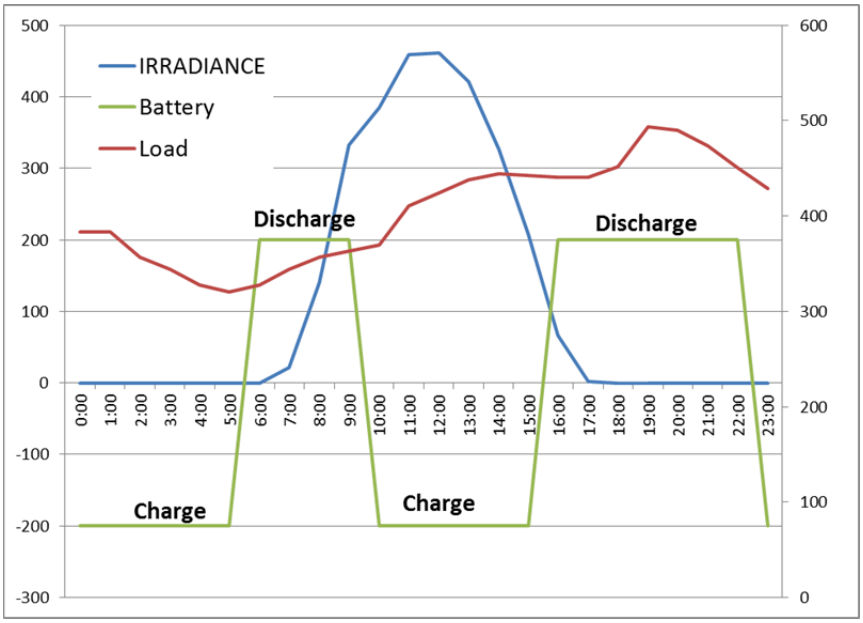

Figure 10: Illustration of excess solar and grid energy utilization, using energy storage

In addition, for smoothing variability, a goal for the SHINES solutions is to absorb most of the large ramps in PV power output and aspire to limit ramps to no more than 10% of PV capacity per minute, which from typical behavior of solar irradiance at locations with clouds and cloud movement, results in requiring at least 50,000 cycles (or at least 5–6 cycles per day) over the 25 year lifetime of energy storage, with each cycle requiring a DoD of up to 40% of the PV capacity in 1 minute or less. As shown conceptually in Figure 11, achieving these targets on energy storage cycles will ideally result in smoothing of large ramps in PV output. These system performance metrics described above can also be met with a combination of energy storage and load management.

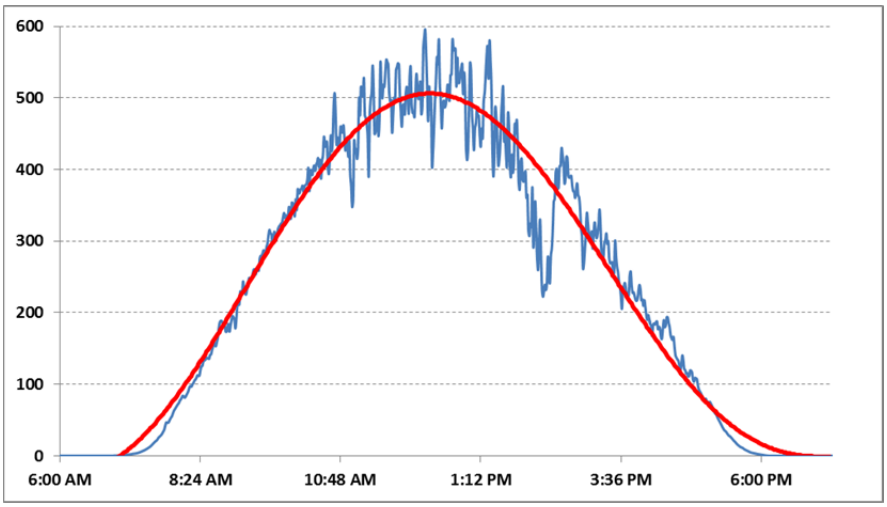

Figure 11: Illustrative example for mitigating variability in solar power output

Lifetime Improvement: The average lifetime of a battery currently is about 7-10 years, depending on its application and cycling requirements. In comparison, the average lifetime of a PV module is about 25 years. As a long term SunShot goal, in an integrated system, the lifetime

of energy storage and all other associated components (such as power electronics etc.) need to be comparable to the PV panels, to avoid replacement and associated costs. Therefore, the SHINES solutions should show a credible technical pathway towards a service lifetime of at least 25 years for each and every individual component. Further, the energy storage component of the solution should demonstrate a round-trip efficiency of at least 90% that is sustainable for its entire 25-year lifetime. If any of the sub-systems or components of the proposed SHINES solution has a less than 25 year service lifetime, then the replacement costs (including capital costs of the new component) need to be included in the levelized cost of energy (LCOE) calculations described in the following paragraph, and the overall solution should still meet all of the target metrics in this FOA. Further, SHINES solutions and all of their components should be designed to be compliant with applicable UL, ANSI, NEC and OSHA standards.

Cost Reduction: One of the key barriers to widespread adoption of energy storage systems (such as batteries), is their cost. The cost of energy storage varies widely depending on the type of storage equipment and application. For example, costs of residential energy storage with advanced lead acid or Li-Ion batteries currently vary between $500– 2000/kWh[10,11]—the wide range being due to various factors such as battery size, number of lifetime cycles, DoD, etc. Studies[12,13] that attempt to investigate the economic viability of energy storage assume significant reductions from current costs for energy storage to have a positive benefit in many markets, while expected reductions in costs by year 2020 are around 50%[14]. In the near term, storage solutions could enable and capture the value of reductions in peak demand charges making it a cost effective part of an overall system for the system host. In the longer term, to enable broader and sustainable adoption of solar and energy storage systems, *technology innovations that leverage the wealth of other developments in electrochemical and other storage types and synergistically integrate them with PV systems to reduce the cost of integrated SHINES solutions* are needed.

For widespread adoption of the SHINES solutions at the residential or commercial levels, the all-in cost of energy from these solutions should be comparable to the "avoided electricity cost" which, in this case, can be approximated by an equivalent average residential electricity rate of

[10] M. Kintner-Meyer, et. al., "National Assessment of Energy Storage for Grid Balancing and Arbitrage: Phase 1, WECC," PNNL Report PNNL-21388, June 2012, *http://energyenvironment.pnnl.gov/pdf/PNNL-21388_National_Assessment_Storage_Phase_1_final.pdf* (Accessed: October 2014).

[11] "Electricity Energy Storage Technology Options. A White Paper Primer on Applications, Costs, and Benefits," Electric Power Research Institute, Product ID: 1020676, December 2010, *http://www.epri.com/abstracts/pages/productabstract.aspx?ProductID=000000000001020676* (Accessed: October 2014)

[12] Y. Ru, J. Kleissl and S. Martinez, "Storage Size Determination for Grid-Connected Photovoltaic Systems," 2012, *http://arxiv.org/pdf/1109.4102v2.pdf* (Accessed: October 2014).

[13] A. Zucker and T. Hinchliffe, "Optimum sizing of PV-attached electricity storage according to power market signals – A case study for Germany and Italy," *Applied Energy* Vol. 127, pp. 141–155, 2014, *http://dx.doi.org/10.1016/j.apenergy.2014.04.038*.

[14] V. Viswanathan, et. al., "National Assessment of Energy Storage for Grid Balancing and Arbitrage Phase II Volume 2: Cost and Performance Characterization," Report PNNL-21388, September 2013, *http://energyenvironment.pnnl.gov/pdf/National_Assessment_Storage_PHASE_II_vol_2_final.pdf*.

about 14 cents/kWh (in nominal U.S. dollars) based on EIA projections[15] for the year 2020. Therefore, the long term LCOE cost target for the SHINES solution is no greater than 14 cents/kWh by the year 2020 fully installed, interconnected to the grid, and approved for operation by the utility, and when manufactured and installed at scale. A credible pathway toward achieving this LCOE target by the year 2020 should be clearly shown for proposed SHINES solution sizes greater than 5 kW up to 2 MW. It is important to note that this LCOE target for the SHINES solution includes the fixed and variable costs for all components of the proposed solution, including the PV plant, energy storage, inverters, all other associated installation, hardware, software, interconnection, and estimated permitting, operations, and maintenance costs. The LCOE of the developed SHINES solution should also include the cost of energy from the grid that will be used (if needed, in addition to energy from the PV) to charge the energy storage component. In addition, if load management is proposed as part of the SHINES solution, all costs associated with load management should also be included in the LCOE determination. Finally, in keeping with the overall SunShot vision, the cost targets to be achieved by the proposed SHINES solution will be based on LCOE values that are estimated without any changes to federal legislation enacted as of this FOA's issue date. Applicants should include in their proposals, a credible and viable pathway toward achieving the LCOE target by the year 2020, and how they will determine the potential reductions in LCOE when their SHINES solution is manufactured at scale (including learning and experience curves). This determination of potential cost reductions due to large-scale manufacturing to meet the LCOE target, should be derived from robust, independent, "investment-grade" analyses with the methodology and assumptions proven to be sustainable and defendable.

Realization of a step-shift in LCOE down to 14¢/kWh by year 2020 for the SHINES solutions will require significant technical innovation in several areas, especially in energy storage sizing, optimization, and management. One of the key challenges is achieving the requirements for DoD and the associated rates, while meeting the cost targets specified earlier. In general, faster charge/discharge rates for energy storage could result in a higher levelized cost of energy[16]. Currently, LCOE for energy storage varies widely based on application, size, and other factors. As an example, Figures 12 and 13 show[17] the variations in LCOE for Li-Ion battery for various cases in two applications: (1) frequency regulation that requires >100,000 cycles over the battery lifetime (Figure 12), and (2) for distributed energy storage system applications that require only a few thousand cycles over the battery lifetime (Figure 13). It can be seen from Figure 12 that the LCOE costs for energy storage are around 20 cents/kWh on average for >1 MW size, high number of cycles and from Figure 13, around $1/kWh on average for smaller size (25-50 kW), lower number of cycles. The energy storage performance requirements for this FOA are a combination of the characteristics of the two applications illustrated in Figures12 and 13 and consist of at least 2 cycles per day with 100% DoD within 1 hour combined with 5-6 cycles per

[15] "Reference Case results for Residential End use electricity prices projection for year 2020," Annual Energy Outlook, AEO2014, EIA, *http://www.eia.gov/forecasts/aeo/er/pdf/0383er(2014).pdf*.

[16] I. Pawel, "The Cost of Storage – How to Calculate the Levelized Cost of Stored Energy (LCOE) and Applications to Renewable Energy Generation," *Energy Procedia* Vol. 46, pp. 68–77, 2014, *http://dx.doi.org/10.1016/j.egypro.2014.01.159* .

[17] A.A. Akhil, et al., "DOE/EPRI 2013 Electricity Storage Handbook in Collaboration with NRECA," SANDIA Report, SAND2013-5131, July 2013, *http://www.sandia.gov/ess/publications/SAND2013-5131.pdf* (Accessed: October 2014).

day with DoD up to 40% of PV capacity in 1 minute or less with at least 4 hours of energy storage. As mentioned earlier, these target performance metrics can also be met with a combination of energy storage and load management.

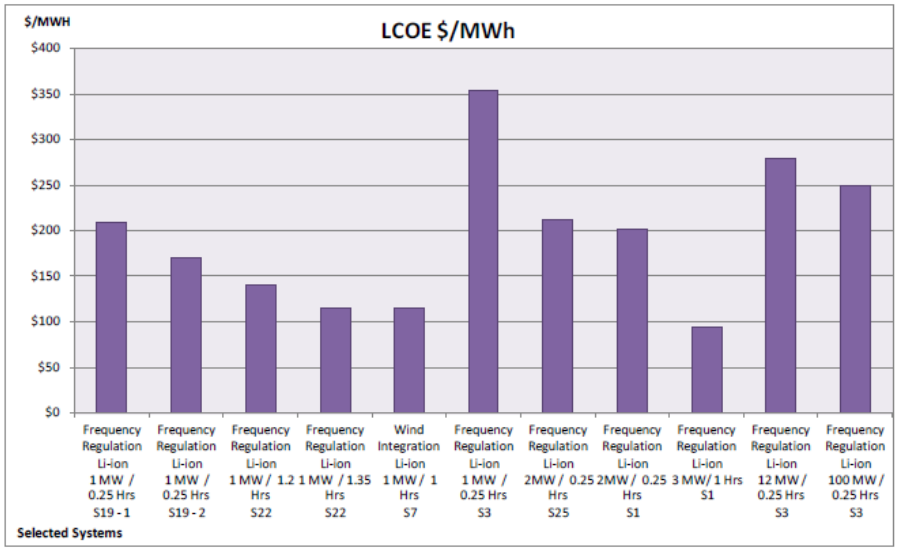

Figure 12: Illustrative LCOE for Li-ion Batteries in Frequency Regulation and Renewable Integration Applications

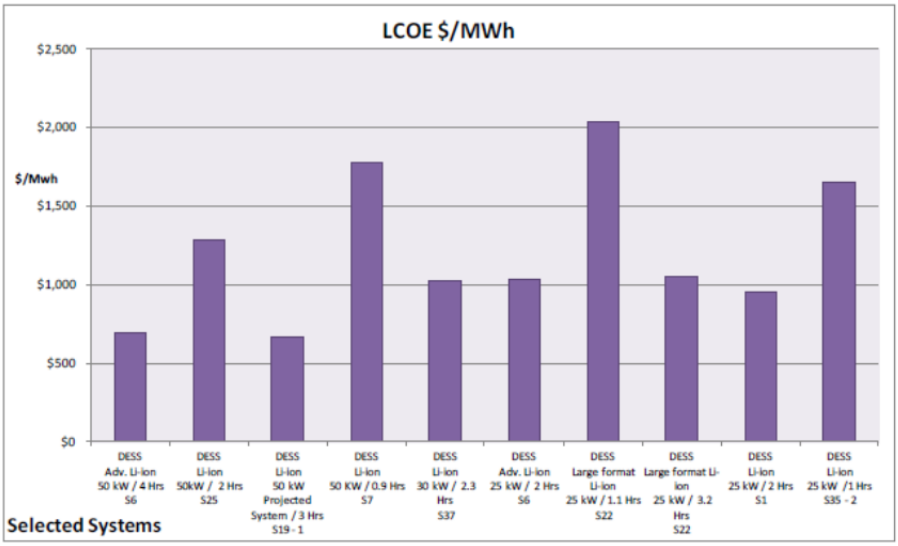

Figure 13: Illustrative LCOE for Li-ion Batteries in Distributed Energy Storage System Applications

LCOE Calculation Process and Assumptions: It is well recognized that the calculation method for LCOE and the assumptions made for various input parameters vary significantly[18] and, will

[18] S.B. Darling, F. You, T. Veselka and A. Velosa "Assumptions and the Levelized Cost of Energy for Photovoltaics," Argonne National Laboratory, *http://www.mcs.anl.gov/papers/P1810.pdf* (Accessed: October 2014)

have an impact on determining the LCOE of the SHINES solution. To ensure consistent methodology and inputs for calculating LCOE, and for ease of comparison of impact of various projects on LCOE, SunShot will provide each applicant selected for award under this solicitation, a customized version of the System Advisor Model (SAM™)[19]. To ensure consistency in comparing LCOE and system performance for all projects, the version of SAM for this FOA will have fixed assumptions for all values that are not directly related to the scope of any project or the SHINES solution to be developed by the applicants. Examples of values which may be fixed by DOE include discount rate, energy price for storage charging from the grid, solar irradiance input to the SHINES solution etc. The customized SAM version will be provided by DOE to awardees under this solicitation. Applicants should plan on determining LCOE for a variety of use cases to demonstrate that the LCOE values calculated are robust and sustainable.

Interoperability, Communications and Control: The proposed SHINES solution must also have the capability to respond to electricity market price signals and incorporate solar and load forecasting in determining optimal behavior of the local system. Further, it must operate in conjunction with smart loads at the PV location, enable demand response in the installation, be interconnected to the local utility grid, and be fully interoperable with the utility's control and communication systems in a manner desired by the utility. The proposed SHINES solutions should use common interoperability, control, and communication protocols and not rely on unique protocols, codes, or standards that cannot be replicated at scale by the broader industry. The SHINES solutions should be compatible "out of the box" to be monitored, communicated to and from, and controlled by utility and home/building energy management systems using at least one of most commonly used protocols by the utility control systems and at least one of the most commonly used protocols by home/building energy management systems. The applicant should also show capability to interoperate with other commonly used communication and control protocols of both utility and home/building energy management systems. It should also be noted that compatibility may be provided using DOE's VOLTTRON[20] open source transaction platform or other open source solutions. For interoperability with home/building energy management systems and load management, applicants are encouraged to leverage the activities being funded by the DOE Buildings Technologies Office that can be found at http://energy.gov/eere/buildings/buildings-grid-integration.

Meeting the performance requirements for the SHINES solutions could require research on identifying cost reduction opportunities and for applying innovative and holistic ideas, including approaches such as a combination of load management and energy storage. In determining the type and characteristics of the SHINES solutions, applicants can consider innovative single and hybrid energy storage components to achieve the desired targets. Further, the efficiencies and cost savings that could be obtained when the energy storage, PV, inverters, and other aspects of the SHINES solution are synergistically designed from scratch considering each other's characteristics, (as opposed to combining separately designed components), performance

[19] https://sam.nrel.gov
[20] http://gridoptics.pnnl.gov/VOLTTRON/

optimization from inverter operation, battery usage, and potential savings in materials are topics that can be investigated by the applicants.

It is expected that the Applicants will leverage current and past work performed in the topic area of this FOA, in other projects and other applications. Examples include adopting as appropriate, work done on existing and proposed energy storage technology and load management advances in the industry, results such as technology advancements and insights from projects funded by private enterprises as well as government entities such as DOE-EERE Vehicle Technologies Office, DOE-EERE Buildings Technologies Office, DOE-ARPA-E, DOE Office of Electricity Delivery & Energy Reliability, DOE Office of Science, the US Advanced Battery Consortium, as well as the Department of Defense. Further, use of energy storage and load management in other applications such as operation of energy storage with wind and other variable generation sources, demand response, providing grid services, and for uninterrupted power supply (UPS) can be investigated for possible research pathways. *It should be noted that this FOA is not intended to fund basic research in energy storage materials or battery electrochemistry, rather, funding will be targeted to leverage advances in energy storage design and performance to create a solution consisting of hardware and development of algorithms, soft/firmware that are integrated with PV systems. In addition, funds contributed to projects must not come from Federal sources.*

SHINES Solutions Summary of Required Performance Metrics

Based on the attributes of the SHINES solutions discussed above, a summary of all the metrics that are required to be met by all the SHINES solutions are given in the Table 1 below.

Table 1. Metrics requirements for the SHINES solution

Area of Focus	Target Metrics to be met by all awardees
Consistent Component Lifetimes	• As the SHINES integrated solution is envisioned to perform for 25 years, components and subsystems are expected to be fully functional during that service lifetime. • If the sub-systems of the proposed SHINES solution are to be replaced within the 25 year lifetime, the overall solution including all equipment replacement costs must meet all of the target metrics in this table and in incorporated into the LCOE calculation. • Further, the SHINES solution and all of its components should be designed to be compliant with applicable ANSI, UL, NEC and OSHA standards.
Performance Requirements for the Energy Storage and Load Management component of the SHINES solution	Over their 25 year service lifetime, the SHINES solutions must satisfy all of the following, • perform ≥ 18,000 cycles (charge and discharge) with DoD 100% of PV capacity within 1 hour; • perform ≥ 50,000 cycles (charge and discharge) with DoD no less than 40% of PV capacity within 1 minute; • have ≥ 90% roundtrip efficiencies for each cycle.;

	• operate at rated power for at least 4 hours with less than 5% internal energy loss in a fully charged state.
SHINES solution cost reduction	• The LCOE target by year 2020 for the entire SHINES solution ≤ 14 cents/kWh fully installed, interconnected to the grid, and approved for operation by the utility, without any changes to federal legislation enacted as of this FOA's issue date, when the SHINES solution is manufactured and installed at scale. • A credible pathway toward meeting the year 2020 LCOE target should be clearly shown for SHINES solution sizes between 5 kW and 2 MW. • The LCOE should include all components of the proposed solution, including the PV plant, energy storage, inverters, all other associated installation, hardware, software, interconnection, permitting, operating costs, and also the cost of energy from the grid used to charge the energy storage component of the SHINES solution.
Project Team	• The project team should include at least one utility, and is also expected to have a PV module supplier/solar installer, inverter company, energy storage supplier, and other key stakeholders as applicable, as part of their team, in designing, developing, and deploying the proposed SHINES solution
Interoperability, Communication and Control	• The SHINES solution must allow for monitoring, communication to and from, and control by utility and home energy management systems using at least one of most commonly used protocols by the utility control systems and at least one of the most commonly used protocols by the home energy management systems. • The SHINES solutions must use common interoperability, control and communication protocols and not rely on unique protocols, codes or standards that cannot be replicated at scale by the broader industry • The SHINES solutions must also show capability to interoperate with other commonly used communication and control protocols of both utility and home energy management systems. • Compatibility may be provided using DOE's VOLTTRON open source transaction platform or other open source solutions. • The SHINES solution must also have the demonstrated capability to respond to electricity market price signals and incorporate solar and load forecasting and as part of its decision making process in determining optimal operations.
Interconnection to the Grid	The SHINES solutions must meet all the interoperability, communication, control and visibility requirements by the utility partner and should also show a credible pathway toward meeting the following interconnection cost and time requirements by year 2020: • Minimizing the need for detailed technical studies to achieve the long term target of the interconnection cost < $1000 for each SHINES solution;

	• Interconnection time < 1 week from initial application to full approval for operations by the utility and other relevant approving agencies.
Benefits	The SHINES solution should clearly show the lasting economic value provided to all stakeholders – measured by net benefits such as lower electricity cost, improved reliability, efficient utilization of solar and load, and others as applicable.
SHINES solution application	The proposed SHINES solution should be shown to be flexible and scalable to support solar penetrations of up to 100% of peak load. The extent of flexibility and scalability of SHINES to support high solar penetrations should be determined in conjunction with existing and proposed distribution grid management schemes implemented by the utility to handle high penetrations of solar.
Infrastructure	The SHINES solution should explore inclusion of existing infrastructure to the extent possible, such as PV panels already present at proposed installation sites and other hardware and software currently available at the location

Designing, deploying, and demonstration of SHINES solutions with specific targets and attributes, as discussed above, are the focus of this FOA. The projects awarded through this FOA are expected to enable disruptive and transformative innovation to create robust, flexible, and reliable SHINES solutions that would enable large-scale integration of solar into the grid in a sustainable, reliable, and cost-effective manner.

D. FOA Required Scope of Work

All applicants to the FOA will be required to propose and perform all three activities in their entirety as given below, as part of the overall project:

1. Design: Create a SHINES conceptual prototype, integrated solution for a residential or non-residential application that is at least 5 kW but less than 2 MW in size, demonstrated to meet all of the metrics given in Table 1. The LCOE of the proposed prototype SHINES solution should be calculated by using the SAM™ software provided by DOE. A credible and clear pathway toward meeting the LCOE target in Table 1 by the year 2020, should be shown , by a robust and exhaustive "investment-grade" analysis by an independent firm, to be achievable with a very high degree of confidence (>95%). The assumptions, methodology, and calculations will also be independently validated by DOE. The applicant can incorporate in addition to PV and energy storage, options such as demand response and load management as part of the SHINES solution to achieve the target metrics of the FOA. Each proposing team is required to include at least one utility partner as an integral and active member, and the proposed SHINES solution should be accepted by the utility to be deployed at scale. Further, the conceptual SHINES solution should demonstrate sustainable potential value to both utility and consumer through economic analysis performed in this activity to estimate the benefits obtained if the proposed solution is deployed. Applicants should also identify additional value propositions resulting from optimal control and operation of the system, by using a multi-stakeholder team approach that includes the utilities,

regulators, PV manufacturers, inverter manufacturers, and consumers in the design and development stage. DOE expects the utility partner in the project team to be integrally involved in the fundamental design and development of the SHINES solution, provide specific guidance on the desired operation of the solution with the utility grid, and for the rest of the project team to demonstrate buy-in from the utility partner. The result from this activity forms a critical milestone in this project and determines the economic and technical viability of the solution proposed by the applicant.

2. Development and Deployment: Perform detailed development and deployment of the proposed SHINES solution, and deploy it at single or multiple installations. It is the expectation of DOE for the deployment to occur in a setting/s that is applicable to a range of conditions widely prevalent across the country, in either actual residential or non-residential buildings of the types shown to be widespread across the nation, with building occupants performing their normal functions. All equipment and components proposed as part of the SHINES solution or proposed to be interacting with the developed SHINES solution should be actual equipment operating in real-world conditions without a proxy or a simulator in place of the actual equipment. This is to ensure that the developed SHINES solution is installed and tested under the most commonly occurring conditions and therefore provides a pathway to facilitate large scale deployment.

Once the SHINES solution is installed, varying levels of hierarchical visualization, control, optimization, and value realization should be studied, based on value propositions of stakeholders. Considerable interaction with both the utility and the consumer, is expected of the SHINES solution, and should be studied as part of the deployment. The operational objectives for the proposed solution should include maximizing cost-effective utilization of installed solar and other components and should further consist of a well-defined set of value metrics that will appeal to a broad range of potential stakeholders (either at residential or non-residential levels), while demonstrating sustained value.

3. Demonstration: Show that all of the targets in Table 1 can be met or exceeded after deployment of SHINES solution, using actual performance data for at least 1 year. Applicants should also propose to show the LCOE of the SHINES solution as deployed, and the pathway to attain the LCOE targets given in table 1 in the FOA by the year 2020, using the LCOE analysis performed in Activity 1 as a starting point. In addition, applicants should perform in depth value and process optimization analysis to show that there will be net benefits, these benefits will be sustained if the SHINES solution is deployed at scale, and show the pathway for deployment of the SHINES solution for levels of penetration of solar up to 100% of peak load. The sustainability of benefits at varying penetration levels of solar can be shown through a blend of results from deployment, and from detailed modeling of deployment under very high solar penetration scenarios. The economic analysis should be done with actual grid, market, and component performance data as applicable, for a continuous period of at least 1 year. Economic modeling should be performed using stakeholder accepted methodologies and assumptions for both the year in which actual data is available, and future years' projections of net benefits under multiple scenarios. The benefits analysis should be performed both pre and post-deployment of the SHINES solution. The pre-deployment analysis as indicated in the Design activity above, will estimate the benefits that will be obtained upon implementation of the proposed solution whereas, the post-deployment analysis in the Demonstration activity will calculate the benefits

obtained using actual data obtained from the installation/s. All pre and post deployment benefits analyses should be performed for two cases: to estimate benefits at the proposed location, and to estimate benefits when the SHINES solution is deployed at scale for high penetration of solar. For each of these two cases, benefits should be estimated short-, mid-, and long-term durations. Short-term is defined as 1-2 years, mid-term is 3-10 years, and long-term is 10-25 years. The assumptions for these analyses should be clearly stated, justified, and buy-in should be demonstrated by stakeholders including the customer and the utility. The extent of validation of results of the benefits analysis performed in the Design activity above with results using actual data post-deployment in the Demonstration activity is a key metric for the success of the project.

Awardees of this FOA will be required to have at least one utility as part of their project team in an active role. To ensure utility buy-in and acceptance of the developed SHINES solution and to increase its chances for future large-scale deployment , description in the proposal on (i) level of specificity regarding the proposed activities by the utility partner, (ii) clarity in the details of participation of the utility, and (iii) demonstration of the strength of the overall commitment by the utility as part of the project team, will be some of the key selection criteria for choosing the awardees of this FOA. It is expected that the applicants will, in addition to at least one utility, also have a PV module manufacturer, solar installer, inverter manufacturer, energy storage manufacturer, and other key stakeholders as applicable, as part of their team, in designing, developing, and deploying the proposed SHINES solution.

E. APPLICATIONS SPECIFICALLY NOT OF INTEREST

The following types of applications will be deemed nonresponsive and will not be reviewed or considered (See Section III.D of the FOA):

- Applications that fall outside the technical parameters specified in Section I.C of the FOA.
- Applications with a focus on basic research in energy storage materials or battery electrochemistry.
- Applications that include a local or small scale diesel or natural gas generator or engine.
- Applications that produce fuels.
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the law of thermodynamics).

II. AWARD INFORMATION

A. AWARD OVERVIEW

1. ESTIMATED FUNDING

EERE expects to make approximately $ 15 million of Federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making approximately 3 - 5 awards under this FOA. EERE may issue one, multiple, or no awards.

Individual awards may vary between $ 500,000 and $5 million.

EERE may establish more than one budget period for each award and fund only the initial budget period(s). Funding for all budget periods, including the initial budget period, is not guaranteed. Before the expiration of the initial budget period(s), EERE may perform a down-select among different recipients and provide additional funding only to a subset of recipients.

2. PERIOD OF PERFORMANCE

EERE anticipates making awards that will run up to 36 months in length. Project continuation will be contingent upon satisfactory performance and go/no-go decision review. At the go/no-go decision points, EERE will evaluate project performance, project schedule adherence, meeting milestone objectives, compliance with reporting requirements, and overall contribution to the program goals and objectives. As a result of this evaluation, EERE will make a determination to continue the project, re-direct the project, or discontinue funding the project. Only those projects demonstrating a high probability of successfully meeting the program targets will be continued.

3. NEW APPLICATIONS ONLY

EERE will accept only new applications under this FOA. EERE will not consider applications for renewals of existing EERE-funded awards through this FOA.

B. EERE FUNDING AGREEMENTS

Through Cooperative Agreements and other similar agreements, EERE provides financial and other support to projects that have the potential to realize the FOA objectives. EERE does not use such agreements to acquire property or services for the direct benefit or use of the United States Government.

1. COOPERATIVE AGREEMENTS

EERE generally uses Cooperative Agreements to provide financial and other support to Prime Recipients.

Through Cooperative Agreements, EERE provides financial or other support to accomplish a public purpose of support or stimulation authorized by Federal statute. Under Cooperative Agreements, the Government and Prime Recipients share responsibility for the direction of projects.

EERE has substantial involvement in all projects funded via Cooperative Agreement. See Section VI.C.8 of the FOA for more information on what substantial involvement may involve.

2. *Funding Agreements with FFRDCs, GOGOs, Federal Agencies and Federal Instrumentalities*

The value of the Federally Funded Research and Development Centers (FFRDC) portion of an award will be included in the award to the Prime Recipient. The proposed budget by the Prime Applicant must include all subcontracts including FFRDCs. The Awardee must then initiate an agreement (e.g. Work for Others, CRADA, or TSA) with any FFRDC Project Team members to arrange work structure, project execution, and any other matters.

3. *Grants*

Although EERE has the authority to provide financial support to Prime Recipients through Grants, EERE generally does not fund projects through Grants. EERE may fund a limited number of projects through Grants, as appropriate.

4. *Technology Investment Agreements*

In rare cases, and if determined appropriate, EERE will consider awarding a Technology Investment Agreement (TIA) to a non-FFRDC applicant. TIAs, governed by 10 CFR Part 603, are assistance instruments used to increase the involvement of commercial entities in the Department's research, development, and demonstration programs. A TIA may be either a type of cooperative agreement or an assistance transaction other than a cooperative agreement, depending on the intellectual property provisions. In both cases, TIAs are not necessarily subject to all of the requirements of 10 CFR Part 600.

In a TIA, EERE may modify the standard Government terms and conditions, including but not limited to:

- Intellectual Property Provisions: EERE may negotiate special arrangements with Recipients to avoid the encumbrance of existing intellectual property rights or to facilitate the commercial deployment of inventions conceived or first actually reduced to practice under the EERE funding agreement.

- Accounting Provisions: EERE may authorize the use of generally accepted accounting principles (GAAP) where Recipients do not have accounting systems that comply with Government recordkeeping and reporting requirements.

EERE will be more amenable to awarding a TIA in support of a proposal from a consortium or a team arrangement that includes cost sharing with the private sector. Such a consortium or teaming arrangement could include a DOE/NNSA FFRDC, other Federal agency, or other Federal agency FFRDC. If the DOE/NNSA FFRDC is a part of the consortium or teaming arrangement, the value of, and funding for the DOE/NNSA FFRDC portion of the work will be authorized and funded under the DOE field work authorization system and performed under the laboratory's Management and Operating contract. Funding for another Federal agency or its FFRDC would be through an interagency agreement under the Economy Act or other statutory authority. Other appropriate contractual accommodations, such as those involving intellectual property, may be made through a "funds in" agreement to facilitate the FFRDCs participation in

the consortium or teaming arrangement. If a TIA is awarded, certain types of information described in 10 CFR 603.420(b) are exempt from disclosure under the Freedom of Information Act for five years after DOE receives the information.

An applicant may request a TIA if it believes that using a TIA could benefit the RD&D objectives of the program (see section 603.225) and can document these benefits. If an applicant is seeking to negotiate a Technology Investment Agreement, the applicant must include an explicit request in its Full Application. After an applicant is selected for award, the Contracting Officer will determine if awarding a TIA would benefit the RD&D objectives of the program in ways that likely would not happen if another type of assistance agreement (e.g., cooperative agreement subject to the requirements of 10 CFR Part 600). The Contracting Officer will use the criteria in 10 CFR 603, Subpart B, to make this determination.

III. ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS

1. INDIVIDUALS

U.S. citizens and lawful permanent residents are eligible to apply for funding as a Prime Recipient or Subrecipient.

2. DOMESTIC ENTITIES

For-profit entities, educational institutions, and nonprofits[21] that are incorporated (or otherwise formed) under the laws of a particular State or territory of the United States are eligible to apply for funding as a Prime Recipient or Subrecipient.

State, local, and tribal government entities are eligible to apply for funding as a Prime Recipient or Subrecipient.

DOE/NNSA Federally Funded Research and Development Centers (FFRDCs) and DOE Government-Owned, Government-Operated laboratories (GOGOs) are eligible to apply for funding as a Prime Recipient or Subrecipient.

Non-DOE/NNSA FFRDCs and non-DOE GOGOs are eligible to apply for funding as a Prime Recipient or Subrecipient.

Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

[21] Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995, are not eligible to apply for funding.

3. *FOREIGN ENTITIES*

Foreign entities, whether for-profit or otherwise, are eligible to apply for funding under this FOA.

Other than as provided in the "Individuals" or "Domestic Entities" sections above, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. If a foreign entity applies for funding as a Prime Recipient, it must designate in the Full Application a subsidiary or affiliate incorporated (or otherwise formed) under the laws of a State or territory of the United States to be the Prime Recipient. The Full Application must state the nature of the corporate relationship between the foreign entity and domestic subsidiary or affiliate.

If a Foreign entity wishes to forego this requirement and serve as the Prime Recipient itself, it may submit a waiver request to EERE as part of its Full Application requesting permission to do so. The waiver request must include the following information:

- Entity name;
- Country of incorporation;
- Description of the work to be performed by the entity for whom the waiver is being requested; and
- Countries where the work will be performed.

In the waiver request, the Applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the interests of EERE to have a foreign entity serve as the Prime Recipient. The Contracting Officer may require additional information before considering the waiver request. Save the waiver request(s) in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_Waiver".

A foreign entity may receive funding as a Subrecipient.

4. *INCORPORATED CONSORTIA*

Incorporated consortia, which may include domestic and/or foreign entities, are eligible to apply for funding as a Prime Recipient or Subrecipient. For consortia incorporated (or otherwise formed) under the laws of a State or territory of the United States, please refer to "Domestic Entities" above. For consortia incorporated in foreign countries, please refer to the requirements in "Foreign Entities" above.

Each incorporated consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium must provide a written description of its internal governance structure and its internal rules to the EERE Contracting Officer.

5. *UNINCORPORATED CONSORTIA*

Unincorporated Consortia, which may include domestic and foreign entities, must designate one member of the consortium to serve as the Prime Recipient/consortium representative. The Prime

Recipient/consortium representative must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. The eligibility of the consortium will be determined by the eligibility of the Prime Recipient/consortium representative under Section III.A of the FOA.

Upon request, unincorporated consortia must provide the EERE Contracting Officer with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each consortium member. This agreement binds the individual consortium members together and should discuss, among other things, the consortium's:

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members' efforts on the project;
- Provisions for members' cost sharing contributions; and
- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

B. COST SHARING

Cost Share 50%
The cost share must be at least 50% of the total allowable costs for demonstration projects (i.e., the sum of the Government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) and must come from non-Federal sources unless otherwise allowed by law. (See 10 CFR 600.30 for the applicable cost sharing requirements.)

To assist Applicants in calculating proper cost share amounts, EERE has included a cost share information sheet and sample cost share calculation as Appendices B and C to this Funding Opportunity Announcement.

1. LEGAL RESPONSIBILITY

Although the cost share requirement applies to the project as a whole, including work performed by members of the project team other than the Prime Recipient, the Prime Recipient is legally responsible for paying the entire cost share. The Prime Recipient's cost share obligation is expressed in the Assistance agreement as a static amount in U.S. dollars (cost share amount) and as a percentage of the Total Project Cost (cost share percentage). If the funding agreement is terminated prior to the end of the project period, the Prime Recipient is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination.

The Prime Recipient is solely responsible for managing cost share contributions by the Project Team and enforcing cost share obligation assumed by Project Team members in subawards or related agreements.

2. *COST SHARE ALLOCATION*

Each Project Team is free to determine how best to allocate the cost share requirement among the team members. The amount contributed by individual Project Team members may vary, as long as the cost share requirement for the project as a whole is met.

3. *COST SHARE TYPES AND ALLOWABILITY*

Every cost share contribution must be allowable under the applicable Federal cost principles, as described in Section IV.I.1 of the FOA. In addition, cost share must be verifiable upon submission of the Full Application.

Project Teams may provide cost share in the form of cash or in-kind contributions. Cash contributions may be provided by the Prime Recipient or Subrecipients. Allowable in-kind contributions include, but are not limited to: personnel costs, indirect costs, facilities and administrative costs, rental value of buildings or equipment, and the value of a service, other resource, or third party in-kind contribution.

Project teams may use funding or property received from state or local governments to meet the cost share requirement, so long as the funding was not provided to the state or local government by the Federal Government.

The Prime Recipient may not use the following sources to meet its cost share obligations including, but not limited to:

- Revenues or royalties from the prospective operation of an activity beyond the project period;
- Proceeds from the prospective sale of an asset of an activity;
- Federal funding or property (e.g., Federal grants, equipment owned by the Federal Government); or
- Expenditures that were reimbursed under a separate Federal Technology Office.

In addition, Project Teams may not use independent research and development (IR&D) funds to meet their cost share obligations. Project Teams may not use the same cash or in-kind contributions to meet cost share requirements for more than one project or program.

Cost share contributions must be specified in the project budget, verifiable from the Prime Recipient's records, and necessary and reasonable for proper and efficient accomplishment of the project. As all sources of cost share are considered part of total project cost, the cost share dollars

will be scrutinized under the same Federal regulations as Federal dollars to the project. Every cost share contribution must be reviewed and approved in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred.

Applicants are encouraged to refer to 10 CFR Parts 600 and 603 for additional guidance on cost sharing, specifically 10 CFR §§600.30, 600.123, 600.224, 600.313, and 603.525-555.

4. Cost Share Contributions by FFRDCs and GOGOs

Because FFRDCs and GOGOs are funded by the Federal Government, costs incurred by FFRDCs and GOGOs generally may not be used to meet the cost share requirement. FFRDCs may contribute cost share only if the contributions are paid directly from the contractor's Management Fee or another non-Federal source.

5. Cost Share Verification

Applicants are required to provide written assurance of their proposed cost share contributions in their Full Applications.

Upon selection for award negotiations, Applicants are required to provide additional information and documentation regarding their cost share contributions. Please refer to Appendix B of the FOA for guidance on the requisite cost share information and documentation.

6. Cost Share Payment

All proposed cost share contributions must be reviewed in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred.

EERE requires Prime Recipients to contribute the cost share amount incrementally over the life of the award. Specifically, the Prime Recipient's cost share for each billing period must always reflect the overall cost share ratio negotiated by the parties (i.e., the total amount of cost sharing on each invoice when considered cumulatively with previous invoices must reflect, at a minimum, the cost sharing percentage negotiated).

In limited circumstances, and where it is in the government's interest, the EERE Contracting Officer may approve a request by the Prime Recipient to meet its cost share requirements on a less frequent basis, such as monthly or quarterly. Regardless of the interval requested, the Prime Recipient must be up-to-date on cost share at each interval. Such requests must be sent by email to the Contracting Officer during award negotiations and include the following information: (1) a detailed justification for the request; (2) a proposed schedule of payments, including amounts and dates; (3) a written commitment to meet that schedule; and (4) such evidence as necessary to demonstrate that the Prime Recipient has complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they may go into effect.

C. Compliance Criteria

Concept Papers and Full Applications must meet all Compliance criteria listed below or they will be considered noncompliant. EERE will not review or consider noncompliant submissions, including Concept Papers, Full Applications, and Replies to Reviewer Comments that were: submitted through means other than EERE Exchange; submitted after the applicable deadline; and/or submitted incomplete. EERE will not extend the submission deadline for Applicants that fail to submit required information due to server/connection congestion.

1. *COMPLIANCE CRITERIA*

i. Concept Papers

Concept Papers are deemed compliant if:

- The Concept Paper complies with the content and form requirements in Section IV.C of the FOA; and
- The Applicant successfully uploaded all required documents and clicked the "Submit" button in EERE Exchange by the deadline stated in this FOA.

ii. Full Applications

Full Applications are deemed compliant if:

- The Applicant submitted a compliant Concept Paper corresponding to the Full Application;
- The Full Application complies with the content and form requirements in Section IV.D of the FOA; and
- The Applicant successfully uploaded all required documents and clicked the "Submit" button in EERE Exchange by the deadline stated in the FOA

iii. Replies to Reviewer Comments

Replies to Reviewer Comments are deemed compliant if:

- The Reply to Reviewer Comments complies with the content and form requirements in Section IV.F of the FOA; and
- The Applicant successfully uploaded all required documents to EERE Exchange by the deadline stated in the FOA.

D. RESPONSIVENESS CRITERIA

Any "Applications Specifically Not of Interest," as described in Section I.C of the FOA, are deemed nonresponsive and are not reviewed or considered.

E. OTHER ELIGIBILITY REQUIREMENTS

1. REQUIREMENTS FOR DOE/NNSA FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS (FFRDC) LISTED AS THE APPLICANT

A DOE/NNSA FFRDC is eligible to apply for funding under this FOA if its cognizant Contracting Officer provides written authorization and this authorization is submitted with the application. If a DOE/NNSA FFRDC is selected for award, the proposed work will be authorized under the DOE work authorization process and performed under the laboratory's Management and Operating (M&O) contract.

The following wording is acceptable for the authorization:

> Authorization is granted for the _____ Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

2. REQUIREMENTS FOR DOE/NNSA AND NON-DOE/NNSA FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS INCLUDED AS A SUBRECIPIENT

DOE/NNSA and non-DOE/NNSA FFRDCs may be proposed as a Subrecipient on another entity's application subject to the following guidelines:

i. Authorization for non-DOE/NNSA FFRDCs

The Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with its authority under its award.

ii. Authorization for DOE/NNSA FFRDCs

The cognizant Contracting Officer for the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The following wording is acceptable for this authorization:

> Authorization is granted for the _____ Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

iii. Value/Funding

The value of the Federally Funded Research and Development Centers (FFRDC) portion of an award will be included in the award to the Prime Recipient. The proposed budget by the Prime Applicant must include all subcontracts including FFRDCs. The Awardee must then initiate an agreement (e.g. Work for Others, CRADA, or TSA) with any FFRDC Project Team members to arrange work structure, project execution, and any other matters.

iv. Cost Share

Although the FFRDC portion of the work is usually excluded from the award to a successful applicant, the applicant's cost share requirement will be based on the total cost of the project, including the applicant's and the FFRDC's portions of the project.

v. Responsibility

The Prime Recipient will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues including, but not limited to disputes and claims arising out of any agreement between the Prime Recipient and the FFRDC contractor.

F. Limitation on Number of Concept Papers and Full Applications Eligible for Review

Applicants may submit more than one Full Application to this FOA, provided that each application describes a unique, scientifically distinct project.

G. Questions Regarding Eligibility

EERE will not make eligibility determinations for potential applicants prior to the date on which applications to this FOA must be submitted. The decision whether to submit an application in response to this FOA lies solely with the applicant.

IV. Application and Submission Information

A. Application Process

The application process will include two phases: a Concept Paper phase and a Full Application phase. **Only applicants who have submitted an eligible Concept Paper will be eligible to submit a Full Application**. At each phase, EERE performs an initial eligibility review of the applicant submissions to determine whether they meet the eligibility requirements of Section III of the FOA. EERE will not review or consider noncompliant and/or nonresponsive or otherwise ineligible submissions. All submissions must conform to the following form and content requirements, including maximum page lengths, described below and must be submitted via EERE Exchange at https://eere-exchange.energy.gov/, unless specifically stated otherwise. **EERE will not review or consider submissions submitted through means other than EERE Exchange, submissions submitted after the applicable deadline, and incomplete**

submissions. EERE will not extend deadlines for Applicants who fail to submit required information and documents due to server/connection congestion. A control number will be issued when an Applicant begins the Exchange application process. This control number must be included with all Application documents, as described below.

The Concept Paper, Full Application, and Reply to Reviewer Comments must conform to the following requirements:

- Each must be submitted in Adobe PDF format unless stated otherwise.
- Each must be written in English
- All pages must be formatted with at least single line spacing to fit on 8.5 x 11 inch paper with margins not less than one inch on every side. Use Times New Roman typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement.
- The Control Number must be prominently displayed on the upper right corner of the header of every page. Page numbers must be included in the footer of every page.
- Each must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If Applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

Applicants are responsible for meeting each submission deadline. **Applicants are strongly encouraged to submit their Concept Papers and Full Applications at least 48 hours in advance of the submission deadline**. Under normal conditions (i.e., at least 48 hours in advance of the submission deadline), Applicants should allow at least 1 hour to submit a Concept Paper, Full Application, or Reply to Reviewer Comments. Once the Application is submitted in EERE Exchange, Applicants may revise or update their application until the expiration of the applicable deadline.

EERE urges Applicants to carefully review their Concept Papers, and Full Applications and to allow sufficient time for the submission of required information and documents. All Full Applications that pass compliance review will undergo comprehensive technical merit review according to the criteria identified in Section V.A.2 of the FOA.

1. Additional Information on EERE Exchange

EERE Exchange is designed to enforce the deadlines specified in this FOA. The "Apply" and "Submit" buttons will automatically disable at the defined submission deadlines. Should applicants experience problems with Exchange, the following information may be helpful:
Applicants that experience issues with submission PRIOR to the FOA deadline: In the event that an Applicant experiences technical difficulties with a submission, the Application should contact the Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The Exchange helpdesk and/or the EERE Exchange system administrators will assist Applicants in resolving issues.
Applicants that experience issue with submissions that result in late submissions: In the event that an Applicant experiences technical difficulties so severe that they are unable to submit their application by the deadline, the Applicant should contact the Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The Exchange helpdesk and/or the EERE Exchange system administrators (EERE-ExchangeSupport@hq.doe.gov) will assist the Applicant in resolving all issues (including finalizing submission on behalf of and with the Applicant's concurrence). PLEASE NOTE, however, that Applicants who are unable to timely submit their application due to their waiting until the last minute when network traffic is at its heaviest to submit their materials will not be able to use this process.

B. APPLICATION FORMS

The application forms and instructions are available on EERE Exchange. To access these materials, go to https://eere-Exchange.energy.gov and select the appropriate funding opportunity number.

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA it must be broken into parts and denoted to that effect. For example:
ControlNumber_LeadOrganization_Project_Part_1
ControlNumber_LeadOrganization_Project_Part_2, etc.

C. CONTENT AND FORM OF THE CONCEPT PAPER

To be eligible to submit a Full Application, Applicants must submit a Concept Paper by specified due date.

Each Concept Paper must be limited to a single concept or technology. Unrelated concepts and technologies should not be consolidated into a single Concept Paper.

1. CONCEPT PAPER CONTENT REQUIREMENTS

The Concept Paper must conform to the following content requirements:

SECTION	PAGE LIMIT	DESCRIPTION

Technology Description	Three (3) pages maximum	Applicants are required to describe succinctly: • The proposed technology, including its basic operating principles and how it is unique and innovative; • The proposed technology's target level of performance (Applicants should provide technical data or other support to show how the proposed target could be met); • The current state-of-the-art in the relevant field and application, including key shortcomings, limitations, and challenges; • How the proposed technology will overcome the shortcomings, limitations, and challenges in the relevant field and application; • The potential impact that the proposed project would have on the relevant field and application; • The key technical risks/issues associated with the proposed technology development plan; and • The impact that EERE funding would have on the proposed project.
Addendum	Two (2) pages maximum	Applicants may provide graphs, charts, or other data to supplement their Technology Description. Applicants are required to describe succinctly the qualifications, experience, and capabilities of the proposed Project Team, including: • Whether the Principal Investigator (PI) and Project Team have the skill and expertise needed to successfully execute the project plan; • Whether the Applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity; • Whether the Applicant has worked together with its teaming partners on prior projects or programs; and • Whether the Applicant has adequate access to equipment and facilities necessary to accomplish the effort and/or clearly explain how it intends to obtain access to the necessary equipment and facilities.

EERE will not review or consider ineligible Concept Papers (see Section III of the FOA).

EERE makes an independent assessment of each Concept Paper based on the criteria in Section V.A.1 of the FOA. EERE will encourage a subset of Applicants to submit Full Applications. Other Applicants will be discouraged from submitting a Full Application. An applicant who receives a "discouraged" notification may still submit a Full Application. EERE will review all eligible Full Applications. However, by discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project in an effort to save the Applicant the time and expense of preparing an application that is unlikely to be selected for award negotiations.

In order to provide Applicants with feedback on their Concept Papers, EERE will include general comments provided from reviewers on an Applicant's Concept Paper in the encourage/discourage notification sent to Applicants at the close of that phase.

D. CONTENT AND FORM OF THE FULL APPLICATION

Applicants must submit a Full Application by the specified due date to be considered for funding under this FOA. Applicants must complete the following application forms found on the EERE Exchange website at https://eere-Exchange.energy.gov/, in accordance with the instructions.

Applicants will have approximately 45 days from receipt of the Concept Paper Encourage/Discourage notification to prepare and submit a Full Application. Regardless of the date the Applicant receives the Encourage/Discourage notification, the submission deadline for the Full Application remains the date stated on the FOA cover page.

All Full Application documents must be marked with the Control Number issued to the Applicant. Applicants will receive a control number upon submission of their Concept Paper, and should include that control number in the file name of their Full Application submission (i.e., *Control number_Applicant Name_Full Application*).

1. *FULL APPLICATION CONTENT REQUIREMENTS*

EERE will not review or consider ineligible Full Applications (see Section III of the FOA).

Each Full Application should be limited to a single concept or technology. Unrelated concepts and technologies should not be consolidated in a single Full Application.

Full Applications must conform to the following requirements:

SUBMISSION	COMPONENTS	FILE NAME (IF NECESSARY)
Full Application (PDF, unless stated otherwise)	Technical Volume (See Chart in Section IV.D.2) (EXCEPTION: The Workplan component of the Technical Volume should be submitted in Microsoft Word Format).	ControlNumber_LeadOrganization_TechnicalVolume
	SF-424 (no page limit)	ControlNumber_LeadOrganization_App424
	Budget Justification (EERE 159) (no page limit, Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Budget_Justification
	Summary for Public Release (1 page max)	ControlNumber_LeadOrganization_Summary
	Summary Slide (1 page limit, Microsoft PowerPoint format)	ControlNumber_LeadOrganization_Slide
	Subaward Budget Justification (EERE 159);	ControlNumber_LeadOrganization_Subawardee_Budget_Justification
	Budget for Federally Funded Research and Development Center Contractor File, (if	ControlNumber_LeadOrganization_FWP

	applicable)	
	Authorization from cognizant Contracting Officer for FFRDC, if applicable	ControlNumber_LeadOrganization_FFRDCAuth
	SF-LLL Disclosure of Lobbying Activities	ControlNumber_LeadOrganization_SF-LLL
	Foreign Entity and Performance of Work in the United States waiver requests (if applicable)	ControlNumber_LeadOrganization_Waiver
	U.S. Manufacturing Plans	ControlNumber_LeadOrganization_USMP

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA it must be broken into parts and denoted to that effect. For example:

ControlNumber_LeadOrganization_Project_Part_1
ControlNumber_LeadOrganization_Project_Part_2, etc.

EERE will not accept late submissions that resulted from technical difficulties due to uploading files that exceed 10MB.

EERE provides detailed guidance on the content and form of each component below.

2. TECHNICAL VOLUME

Except where otherwise specified, the Technical Volume must be submitted in Adobe PDF format. The Technical Volume must conform to the following content and form requirements, including maximum page lengths. If Applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages. This volume must address the Merit Review Criteria as discussed in Section V.A.2 of the FOA. Save the Technical Volume in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_TechnicalVolume".

Applicants must provide sufficient citations and references to the primary research literature to justify the claims and approaches made in the Technical Volume. EERE and reviewers may review primary research literature in order to evaluate applications. However, EERE and reviewers are under no obligation to review cited sources (e.g., internet websites).

The Technical Volume to the Full Application may not be more than Thirty (30) pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.2 of the FOA) when preparing the Technical Volume.

SECTION/PAGE LIMIT	DESCRIPTION

Cover Page	The cover page should include the project title, both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Project Overview (This section should constitute approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The Applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The Applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The Applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Technical Description, Innovation, and Impact (This section should constitute approximately 25% of the Technical Volume)	The Technical Description should contain the following information: • Relevance and Outcomes: The Applicant should provide a detailed description of the technology, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The Applicant should clearly specify the expected outcomes of the project. • Feasibility: The Applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. • Innovation and Impacts: The Applicant should describe the current state of the art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies, and the overall impact on advancing the state of the art/technical baseline if the project is successful.
Workplan (This section should constitute approximately 45% of the Technical Volume and should be submitted in Microsoft Word format)	The Workplan should contain the following information: • Project Objectives: The Applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The Applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on go/no-go decision points). The applicant should describe the specific expected end result of each performance period. • Work Breakdown Structure (WBS) and Task Descriptions: The Workplan should fully describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks,

	which is typical of a standard work breakdown structure (WBS) for any project. The Workplan shall contain a concise detailed description of the specific activities to be conducted over the life of the project. "Detailed" is defined as a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the Applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. To this end each task and subtask is to have a unique number and title and an indication of the duration of the task or subtask in months. Each task and subtask is to have a task summary that describes the objectives, what work is to be accomplished, and relationship to project deliverables or expected results. Appropriate milestones should be incorporated into the task and subtask structure. Each task and subtask is to have a technical details section, as appropriate, to discuss how the work will be done, anticipated problems or uncertainties, and any further clarification, such as why a specific approach is being taken. An example Work Breakdown Structure is provided below. • Milestones: The Applicant should provide appropriate milestones throughout the project to demonstrate success, where success is defined as technical achievement rather than simply completing a task. To ensure that milestones are relevant, Applicants should follow the SMART rule of thumb, which is that all milestones should be **S**pecific, **M**easurable, **A**chievable, **R**elevant, and **T**imely. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The Applicant should also provide the means by which the milestone will be verified. In addition to describing milestones in the Workplan text and including them in the schedule, the Applicant is required to complete the Milestone Summary Table shown below. • Go/No-Go Decision Points: The Applicant should provide project-wide go/no-go decision points at appropriate points in the Workplan. A go/no-go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one project-wide go/no-go decision point for each year (12-month period) of the project. The Applicant should also provide the specific technical criteria to be used to make the go/no-go decision. In addition to describing the go/no-go decision points in the Workplan text and including them in the schedule, the Applicant is required to complete the Milestone Summary Table shown below, which must include go/no-go decision points and their method of verification. • Project Schedule (Gantt Chart or similar): The Applicant should provide a detailed schedule for the entire project, including task and subtask durations, milestones, and go/no-go decision points. • Project Management: The Applicant should discuss the team's proposed management plan, including the following: o The overall approach to and organization for managing the work o The roles of each Project Team member o Any critical handoffs/interdependencies among Project Team

	members o The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices o The approach to project risk management o A description of how project changes will be handled o If applicable, the approach to Quality Assurance/Control o How communications will be maintained among Project Team members • Market Transformation/Commercialization Plan: The Applicant should provide a market transformation/commercialization plan, including the following: o Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan o Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, U.S. manufacturing plan etc., and product distribution.

Example Milestone Summary Table and Work Breakdown Structure are provided on following two pages, after which the Technical Volume requirements will continue.

Milestone Summary Table							
Recipient Name:							
Project Title:							
Task Number	**Task Title or Subtask Title (If Applicable)**	**Milestone Type (Milestone or Go/No-Go Decision Point)**	**Milestone Number* (Go/No-Go Decision Point Number)**	**Milestone Description (Go/No-Go Decision Criteria)**	**Milestone Verification Process (What, How, Who, Where)**	**Anticipated Date (Months from Start of the Project)**	**Anticipated Quarter (Quarters from Start of the Project)**

*Milestone numbering convention should align with Task and Subtask numbers, as appropriate. For example, M1.1, M3.2, etc.

Note 1: It is required that each project have at least one milestone per quarter for the entire project duration. It is not necessary that each task have one milestone per quarter.

Note 2: It is required that each project have at least one project-wide go/no-go decision point each year. If a decision point is not specific to a particular task, then you may leave the task information blank for those decision points.

Note 3: All milestones should follow the SMART rule of thumb: Specific, Measureable, Achievable, Relevant, and Timely

Example Work Breakdown Structure

Technical Summary: Provide a high-level overview of the final result of this project. Explain the final objective, outcome, milestone and/or deliverable that are to be produced and the rationale for why the applicant has organized the tasks in the way they have.

Technical Details (Optional): Describe the relevant management, engineering, design, process, scientific or other principles and aspects of the project that warrant discussion.

Task 1: Distinctive Title, Date range of the task in months (M1-M4)

Task Summary: Task summaries shall explicitly describe what work is to be accomplished, identify the project objectives/outcomes being addressed and provide a concise statement of the objectives of that task. In addition, the description should indicate the project deliverables that this task will help achieve (D1, D2, D5 etc. note that deliverables may be applicable to multiple or all tasks.]

Task Details: Within this section, the barriers and risks should be identified, as well as the approaches for overcoming those barriers and risks. Where appropriate, multiple pathways early in the effort can be outlined for risk reduction.

Milestone 1.1 (if applicable)
Milestone 1.2 (if applicable)
Etc.

Subtask 1.1: Date range (M1-M2)

Subtask Summary: Describe the specific and detailed work efforts that go into achieving the higher-level tasks.

Subtask Details: Describe the evaluation techniques that will be used and the expected result that will be generated from the effort.

Milestone 1.1.1 (if applicable)
Milestone 1.1.2 (if applicable)
Etc.

Subtask 1.2:
(Continue until all Task 1 subtasks are listed)

Task 2: (continue in the format above until all tasks and subtasks are listed)
Subtask 2.1: Description and Discussion
Subtask 2.2: Description and Discussion

Technical Qualifications and Resources (Approximately 15% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information: • Describe the Project Team's unique qualifications and expertise, including those of key subrecipients • Describe the Project Team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the Applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project. • Attach one-page resumes for key participating team members as an appendix. Resumes do not count towards the page limit. Multi-page resumes are not allowed. • Describe the technical services to be provided by DOE/NNSA FFRDCs and GOGOs, if applicable. • Attach any letters of support from partners/end users as an appendix (1 page maximum per letter). Letters of support do not count towards the page limit. • For multi-organizational or multi-investigator projects, describe succinctly: o The roles and the work to be performed by each PI and Key Participant; o Business agreements between the Applicant and each PI and Key Participant; o How the various efforts will be integrated and managed; o Process for making decisions on scientific/technical direction; o Publication arrangements; o Intellectual Property issues; and o Communication plans
Applicant's team members participation (Approximately 5% of the Technical Volume)	This portion of the application should clearly explain why each team member is part of the team, what skills and qualifications they bring to the project, what is the impact on the project if a particular team member is no longer part of the team, what are the specific decisions in the project impacted by each team member, and for each team member – the level of participation and the process and extent of buy-in to the proposed SHINES solution

3. SF-424: Application for Federal Assistance

Complete all required fields in accordance with the instructions on the form. The list of certifications and assurances in Field 21 can be found at http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms, under Certifications and Assurances. Note: The dates and dollar amounts on the SF-424 are for the complete project period and not just the first project year, first phase or other subset of the

project period. Save the SF-424 in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_App424".

4. BUDGET JUSTIFICATION WORKBOOK (EERE 159)

Applicants are required to complete the Budget Justification Workbook. This form is available on EERE Exchange at https://eere-Exchange.energy.gov/. Prime Recipients must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the Prime Recipient and its Subrecipients and Contractors, and provide all requested documentation (e.g., a Federally-approved forward pricing rate agreement, Defense Contract Audit Agency or Government Audits and Reports, if available). Applicants should include costs associated with required annual audits and incurred costs proposals in their proposed budget documents. The "Instructions and Summary" included with the Budget Justification Workbook will "auto-populate" as the Applicant enters information into the Workbook. Applicants must carefully read the "Instructions and Summary" tab provided within the Budget Justification Workbook. Save the Budget Justification Workbook in a single Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Budget_Justification".

5. SUMMARY/ABSTRACT FOR PUBLIC RELEASE

Applicants are required to submit a one-page summary/abstract of their project. The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identified the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as the Department may make it available to the public after selections are made. The project summary must not exceed 1 page when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 11 point. Save the Summary for Public Release in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Summary".

6. SUMMARY SLIDE

Applicants are required to provide a single PowerPoint slide summarizing the proposed project. The slide must be submitted in Microsoft PowerPoint format. This slide is used during the evaluation process. Save the Summary Slide in a single file using the following convention for the title "ControlNumber_LeadOrganization_Slide".

The Summary Slide template requires the following information:

- A technology Summary;
- A description of the technology's impact;
- Proposed project goals;
- Any key graphics (illustrations, charts and/or tables);

- The project's key idea/takeaway;
- Project title, Prime Recipient, Principal Investigator, and Key Participant information; and
- Requested EERE funds and proposed applicant cost share.

7. SUBAWARD BUDGET JUSTIFICATION (EERE159)

Applicants must provide a separate budget justification, EERE 159 (i.e., budget justification for each budget year and a cumulative budget) for each subawardee that is expected to perform work estimated to be more than $250,000 or 25 percent of the total work effort (whichever is less). The budget justification must include the same justification information described in the "Budget Justification" section, above. Save each subaward budget justification in a Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Subawardee_Budget_Justification".

8. BUDGET FOR DOE/NNSA FFRDC (IF APPLICABLE)

If a DOE/NNSA FFRDC contractor is to perform a portion of the work, the Applicant must provide a DOE Field Work Proposal (FWP) in accordance with the requirements in DOE Order 412.1, Work Authorization System. DOE Order 412.1 and DOE O 412.1 (Field Work Proposal form) area available at the following link, under "DOE Budget Forms": https://www.directives.doe.gov/directives/0412.1-BOrder-a/view. Save the FWP in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FWP".

9. AUTHORIZATION FOR NON-DOE/NNSA OR DOE/NNSA FFRDCS

The Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with the contractor's authority under its award. Save the Authorization in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FFRDCAuth".

10. SF-LLL: DISCLOSURE OF LOBBYING ACTIVITIES

Prime Recipients and Subrecipients may not use any Federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Prime Recipients and Subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (http://www.whitehouse.gov/sites/default/files/omb/grants/sflllin.pdf) if any non-Federal funds have been paid or will be paid to any person for influencing or attempting to influence any of the following in connection with your application:

- An officer or employee of any Federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

Save the SF-LLL in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_SF-LLL".

11. Waiver Requests: Foreign Entities and Performance of Work in the United States

i. Foreign Entity Participation:

As set forth in Section III.A.3, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. To request a waiver of this requirement, the Applicant must submit an explicit waiver request in the Full Application. Waiver information is provided in Section III.A.3 of the FOA.

ii. Performance of Work in the United States

All work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. Section IV.I.3 lists the necessary information that must be included in a request to waive the Performance of Work in the United States requirement.

12. U.S. Manufacturing Plans

As part of the application, Applicants are required to submit a U.S. Manufacturing Plan. The U.S. Manufacturing Plan represents the applicant's measurable commitment to support U.S. manufacturing of the results from its award.

The nature and specificity of the applicants' U.S. Manufacturing Plans are expected to vary based on the FOA. A higher level of specificity is expected in U.S. Manufacturing Plans for technologies at higher technology readiness levels due to the greater certainty surrounding the commercialization of these awards. U.S. Manufacturing Plans submitted in response to FOAs targeting technologies at high technology readiness levels or demonstration activities should include specific commitments to manufacturing in the U.S. For example, a U.S. Manufacturing Plan may commit to manufacturing products that embody or are made through the use of IP developed under the award in the U.S. or making investments in U.S. facilities to support product manufacture. U.S. Manufacturing Plans submitted in response to FOAs directed at technologies at lower technology readiness levels may have fewer specific manufacturing details and may focus more on licensing and other strategies to promote U.S. manufacturing.

The weight given to the U.S. Manufacturing Plans during the review and selection process varies based on the particular FOA. Applicants should review Section V.A.2 of this FOA to determine the weight given to the U.S. Manufacturing Plans under this FOA.

When an applicant is selected for an award, the U.S. Manufacturing Plan submitted by the applicant becomes part of the terms and conditions of the award. The applicant/awardee may

request a waiver or modification of the U.S. Manufacturing Plan from DOE upon a showing that the original U.S. Manufacturing Plan is no longer economically feasible.

13. Data Management Plan

Applicants whose Full Applications are selected for award negotiations will be required to submit a Data Management Plan during the award negotiations phase. The Data Management Plan is a document that outlines the proposed plan for data sharing or preservation. Submission of this plan is required, and failure to submit the plan may result in the termination of award negotiations. As a courtesy, guidance for preparing a Data Management Plan is provided in Appendix D of the FOA.

E. Post-Award Information Requests

If selected for award, EERE reserves the right to request additional or clarifying information for any reason deemed necessary, including but not limited to:

- Indirect cost information
- Other budget information
- Commitment Letters from Third Parties Contributing to Cost Share, if applicable
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5)
- Representation of Limited Rights Data and Restricted Software, if applicable
- Environmental Questionnaire

F. Content and Form of Replies to Reviewer Comments

EERE will provide Applicants with reviewer comments following evaluation of all eligible Full Applications. Applicants will have approximately three business days to prepare a short Reply to Reviewer Comments responding to comments however they desire or supplementing their Full Application. EERE will notify applicants via email when the Reviewer Comments are available for reply. The expected submission deadline is on the cover page of the FOA; however, it is the applicant's responsibility to monitor email in the event that the expected date changes. The deadline will not be extended for applicants who are unable to timely submit their reply due to failure to check email or relying on the expected date alone.

EERE will not review or consider ineligible Replies to Reviewer Comments (see Section III of the FOA). EERE will review and consider each eligible Full Application, even if no Reply is submitted or if the Reply is found to be ineligible.

Replies to Reviewer Comments must conform to the following content and form requirements, including maximum page lengths, described below. If a Reply to Reviewer Comments is more

than three pages in length, EERE will review only the first three pages and disregard any additional pages.

SECTION	PAGE LIMIT	DESCRIPTION
Text	2 pages max	Applicants may respond to one or more reviewer comments or supplement their Full Application.
Optional	1 page max	Applicants may use this page however they wish; text, graphs, charts, or other data to respond to reviewer comments or supplement their Full Application are acceptable.

G. Submission Dates and Times

Concept Papers, Full Applications, and Replies to Reviewer Comments must be submitted no later than 5p.m. Eastern on the dates provided on the cover page of this FOA.

H. Intergovernmental Review

This FOA is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

I. Funding Restrictions

1. Allowable Costs

All expenditures must be allowable, allocable, and reasonable in accordance with the applicable Federal cost principles.

Refer to the following applicable Federal cost principles for more information:

- 2 CFR 220 for Educational Institutions;
- 2 CFR 225 for State, Local, and Indian Tribal Governments;
- 2 CFR 230 for Non Profit Organizations; and
- FAR Part 31 for For-Profit entities.

2. Pre-Award Costs

Selectees may charge pre-award costs incurred on R&D awards within the 90-day period immediately preceding the effective date of the award. If the Selectee is a for-profit, non-profit, or University, prior approval by the CO to incur pre-award costs is not required unless the costs are more than $25,000. If the Selectee is a governmental entity, it must request prior approval from the CO to incur pre-award costs, regardless of the amount.

Pre-award costs cannot be incurred prior to the Selection Official signing the Selection Statement and Analysis. Pre-award costs can only be incurred if such costs would be reimbursable under the agreement if incurred after award.

Pre-Award expenditures are made at the Selectee's risk; EERE is not obligated to reimburse costs: (1) in the absence of appropriations; (2) if an award is not made; or (3) if an award is made for a lesser amount than the Selectee anticipated.

i. Pre-Award Costs Related to National Environmental Policy Act (NEPA) Requirements

EERE's decision whether and how to distribute federal funds under this FOA is subject to NEPA. Applicants should carefully consider and should seek legal counsel or other expert advice before taking any action related to the proposed project that would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to EERE completing the NEPA review process.

EERE does not guarantee or assume any obligation to reimburse costs where the Prime Recipient incurred the costs prior to receiving written authorization from the Contracting Officer. If the Applicant elects to undertake activities that may have an adverse effect on the environment or limit the choice of reasonable alternatives prior to receiving such written authorization from the Contracting Officer, the Applicant is doing so at risk of not receiving Federal funding and such costs may not be recognized as allowable cost share. Likewise, if a project is selected for negotiation of award, and the Prime Recipient elects to undertake activities that are not authorized for Federal funding by the Contracting Officer in advance of EERE completing a NEPA review, the Prime Recipient is doing so at risk of not receiving Federal Funding and such costs may not be recognized as allowable cost share. Nothing contained in the pre-award cost reimbursement regulations or any pre-award costs approval letter from the Contracting Officer override these NEPA requirements to obtain the written authorization from the Contracting Officer prior to taking any action that may have an adverse effect on the environment or limit the choice of reasonable alternatives.

3. PERFORMANCE OF WORK IN THE UNITED STATES

a. Requirement.

All work performed under EERE Awards must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment; however, the Recipient should make every effort to purchase supplies and equipment within the United States. The Recipient must flow down this requirement to its subrecipients.

b. Failure to Comply.

If the Recipient fails to comply with the Performance of Work in the United States requirement, EERE may deny reimbursement for the work conducted outside the United States and such costs may not be recognized as allowable Recipient cost share. The Recipient is responsible should

any work under this Award be performed outside the United States, absent a waiver, regardless of if the work is performed by the Recipient, subrecipients, vendors or other project partners.

c. Waiver.

There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the Unites States requirement, the Recipient must submit a written waiver request to EERE, which includes the following information:

- The countries in which the work is proposed to be performed;
- A description of the work to proposed to performed outside the U.S.;
- Proposed budget of work to be performed; and
- The rationale for performing the work outside the U.S.

For the rationale, the Recipient must demonstrate to the satisfaction of EERE that a waiver would further the purposes of the FOA that the Award was selected under and is otherwise in the interests of EERE and the United States. EERE may require additional information before considering a waiver request. Save the waiver request(s) in a single PDF file titled "ControlNumber_PerformanceofWork_Waiver".

4. CONSTRUCTION

EERE generally does not fund projects that involve major construction (i.e., construction of new buildings, major renovations, or additions to existing buildings). Recipients are required to obtain written authorization from the Contracting Officer before incurring any major construction costs.

5. FOREIGN TRAVEL

If international travel is proposed for your project, please note that your organization must comply with the International Air Transportation Fair Competitive Practices Act of 1974 (49 USC 40118), commonly referred to as the "Fly America Act," and implementing regulations at 41 CFR 301-10.131 through 301-10.143. The law and regulations require air transport of people or property to, from, between, or within a country other than the United States, the cost of which is supported under this award, to be performed by or under a cost-sharing arrangement with a U.S. flag carrier, if service is available.

6. EQUIPMENT AND SUPPLIES

To the greatest extent practicable, all equipment and products purchased with funds made available under this FOA should be American-made. This requirement does not apply to used or leased equipment.

Property disposition will be required at the end of a project if the property is no longer used by the Prime Recipient for the objectives of the project, and the fair market value of property

exceeds $5,000. The rules for property disposition are set forth in the following sections of 10 CFR Part 600:

- 10 CFR 600.130 to 600.137 for Universities, Hospitals, or other Nonprofit Institutions;
- 10 CFR 600.231 to 600.233 for State and Local Governments; and
- 10 CFR 600.320 to 600.325 for For-Profit organizations.

7. LOBBYING

Recipients and Subrecipients may not use any Federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Recipients and Subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (http://www.whitehouse.gov/sites/default/files/omb/grants/sflllin.pdf) if any non-Federal funds have been paid or will be paid to any person for influencing or attempting to influence any of the following in connection with your application:

- An officer or employee of any Federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

V. APPLICATION REVIEW INFORMATION

A. TECHNICAL REVIEW CRITERIA

1. CONCEPT PAPERS

Concept Papers are evaluated based on the following criteria:

Criterion 1: Impact of the Proposed Technology Relative to State of the Art (50%)
This criterion involves consideration of the following factors:

- Method used to identify current state of the art technology
- If technical success is achieved, the proposed idea would significantly improve technical and economic performance relative to the state of the art.

Criterion 2: Overall Scientific and Technical Merit (50%)
This criterion involves consideration of the following factors:

- The proposed technology is unique and innovative; and
- The proposed approach is without major technical flaws.

2. FULL APPLICATIONS

Applications will be evaluated against the merit review criteria shown below.

Criterion 1: Technical Merit, Innovation, and Impact Weight: 50%

Technical Merit and Innovation

- Extent to which the proposed technology or process is innovative and has the potential to advance the state of the art;
- Degree to which the current state of the technology and the proposed advancement are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state of the art to the proposed advancement;
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations, and discussion of prior work in the literature with analysis that supports the viability of the proposed work;
- Extent to which the proposed solution is capable of incorporating existing infrastructure.
- Extent to which the proposed solution will meet the LCOE target given in Table 1 by year 2020;
- Extent to which the proposed solution will meet the interconnection cost and time requirements given in Table 1 by year 2020;
- Extent of widespread applicability of the proposed solution with minimal or no changes – especially in the residential sector; and
- Extent of transformational innovation proposed as part of the SHINES solution as opposed to incremental advances in existing products or solutions.

Impact of Technology Advancement

- How the project supports the topic area objectives and achieves the target specifications and metrics in Table 1; and
- The potential impact of the project on advancing the state of the art.

Criterion 2: Project Research and Market Transformation Plan Weight: 30%

Research Approach and Workplan

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan will succeed in meeting the project goals.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work, and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and

- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and
- Comprehensiveness of commercialization plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, U.S. manufacturing plan etc., and product distribution.

Criterion 3: Team and Resources Weight: 20%

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a good chance of success.
- Qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- Degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- Level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan,
- Reasonableness of budget and spend plan for proposed project and objectives.
- Degree of "hands-on" involvement of the utility partner in each proposed activity and design, development and deployment of the SHINES solution, and
- Sufficiency of team composition in terms of including all relevant stakeholders and decision makers to achieve project objectives

3. *Criteria for Replies to Reviewer Comments*

EERE has not established separate criteria to evaluate Replies to Reviewer Comments. Instead, Replies to Reviewer Comments are attached to the original applications and evaluated as an extension of the Full Application.

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA, by the standards set forth in EERE's Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011) and the guidance provided in the "Department of Energy Merit Review Guide for Financial Assistance," which is available at: http://energy.gov/sites/prod/files/meritrev.pdf.

C. Other Selection Factors

1. *Program Policy Factors*

In addition to the above criteria, the Selection Official may consider the following program policy factors in determining which Full Applications to select for award negotiations:

- The degree to which the proposed project, including proposed cost shares, optimizes the use of available EERE funding to achieve programmatic objectives;
- The level of industry and utility involvement and demonstrated ability to commercialize energy or related technologies;
- Technical, market, organizational, and environmental risks associated with the project;
- Whether the proposed project is likely to lead to increased employment and manufacturing in the United States, based on the U.S. Manufacturing Plan;
- Whether the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty;
- The degree to which the proposed project directly addresses EERE's statutory mission and strategic goals;
- Diversity of technical approaches and methods; and
- Diversity and geographic distribution of institutions and organizations.
- Whether the proposed project will advance the goals of the Climate Action Champion Initiative, as committed to by the designated Champion pursuant to its designation agreement. The Climate Action Champion Initiative goals include improving climate resilience and reducing greenhouse gas emissions. (This program policy factor is only applicable to (1) projects proposed by Climate Action Champions[22] as designated under DOE's Request for Applications DE-FOA-0001189; (2) A projects proposed by a member of a regional collaboration or consortium designated as a Champion and (3) projects proposed in a Climate Action Champion community where the applicant submits a letter from the Champion confirming the proposed project would further the Champion's goals under the Climate Action Champion Initiative.)

D. Evaluation and Selection Process

1. *Overview*

The evaluation process consists of multiple phases that each include an initial eligibility review and a thorough technical review. Rigorous technical reviews are conducted by reviewers that are experts in the subject matter of the FOA. Ultimately, the Selection Official considers the

[22] In recognition of the importance of the dual policy goals of reducing greenhouse gas emissions and enhancing climate resilience, the U.S. Department of Energy (DOE) – in close collaboration with other Federal agencies – launched the Climate Action Champion initiative to identify and showcase U.S. local and tribal governments that have proven to be climate leaders through pursuing opportunities to advance both of these goals in their communities. Recently, DOE selected sixteen (16) U.S. local governments and tribal governments – or regional collaborations or consortia thereof – that demonstrated a strong and ongoing commitment to implementing strategies that both reduce greenhouse gas emissions and enhance climate resilience, with a particular emphasis on strategies that further both goals. http://www.whitehouse.gov/blog/2014/12/03/announcing-first-class-climate-action-champions

recommendations of the reviewers, along with other considerations such as program policy factors, in determining which applications to select.

2. *PRE-SELECTION INTERVIEWS*

As part of the evaluation and selection process, EERE may invite one or more applicants to participate in Pre-Selection Interviews. Pre-Selection Interviews are distinct from and more formal than pre-selection clarifications (See Section V.D.3 of the FOA). The invited applicant(s) will meet with EERE representatives to provide clarification on the contents of the Full Applications and to provide EERE an opportunity to ask questions regarding the proposed project. The information provided by applicants to EERE through Pre-Selection Interviews contributes to EERE's selection decisions.

EERE will arrange to meet with the invited applicants in person at EERE's offices or a mutually agreed upon location. EERE may also arrange site visits at certain Applicants' facilities. In the alternative, EERE may invite certain applicants to participate in a one-on-one conference with EERE via webinar, videoconference, or conference call.

EERE will not reimburse Applicants for travel and other expenses relating to the Pre-Selection Interviews, nor will these costs be eligible for reimbursement as pre-award costs.

EERE may obtain additional information through Pre-Selection Interviews that will be used to make a final selection determination. EERE may select applications for funding and make awards without Pre-Selection Interviews. Participation in Pre-Selection Interviews with EERE does not signify that Applicants have been selected for award negotiations.

3. *PRE-SELECTION CLARIFICATION*

EERE may determine that pre-selection clarifications are necessary from one or more applicants. These pre-selection clarifications will solely be for the purposes of clarifying the application, and will be limited to information already provided in the application documentation. The pre-selection clarifications may occur before, during or after the merit review evaluation process. Information provided by an applicant that is not necessary to address the pre-selection clarification question will not be reviewed or considered. Typically, a pre-selection clarification will be carried out through either written responses to EERE's written clarification questions or video or conference calls with EERE representatives.
The information provided by Applicants to EERE through pre-selection clarifications is incorporated in their applications and contributes to the merit review evaluation and EERE's selection decisions. If EERE contacts an applicant for pre-selection clarification purposes, it does not signify that the applicant has been selected for negotiation of award or that the applicant is among the top ranked applications.

EERE will not reimburse applicants for expenses relating to the pre-selection clarifications, nor will these costs be eligible for reimbursement as pre-award costs.

4. *SELECTION*

The Selection Official may consider the technical merit, the Federal Consensus Board's recommendations, program policy factors, and the amount of funds available in arriving at selections for this FOA.

VI. AWARD ADMINISTRATION INFORMATION

A. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES

EERE anticipates notifying applicants selected for negotiation of award by the end of June 2015 and making awards by the end of August 2015.

B. AWARD NOTICES

1. REJECTED SUBMISSIONS

Ineligible Concept Papers and Full Applications are rejected by the Contracting Officer and are not reviewed or considered. The Contracting Officer sends a notification letter by email to the technical and administrative points of contact designated by the Applicant in EERE Exchange. The notification letter states the basis upon which the Concept Paper was discouraged or the Full Application was rejected.

2. CONCEPT PAPER NOTIFICATIONS

EERE notifies Applicants of its determination to encourage or discourage the submission of a Full Application. EERE sends a notification letter by email to the technical and administrative points of contact designated by the Applicant in EERE Exchange.

Applicants may submit a Full Application even if they receive a notification discouraging them from doing so. By discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project. Such assessments do not necessarily reflect judgments on the merits of the proposed project. The purpose of the Concept Paper phase is to save Applicants the considerable time and expense of preparing a Full Application that unlikely to be selected for award negotiations.

A notification letter encouraging the submission of a Full Application does not authorize the Applicant to commence performance of the project. Please refer to Section IV.J.2 of the FOA for guidance on pre-award costs.

3. FULL APPLICATION NOTIFICATIONS

EERE notifies Applicants of its determination via a notification letter by email to the technical and administrative points of contact designated by the Applicant in EERE Exchange. The notification letter may inform the Applicant that its Full Application was selected for award negotiations, or not selected for award. Alternatively, EERE may notify one or more Applicants

that a final selection determination on particular Full Applications will be made at a later date, subject to the availability of funds or other factors.

Written feedback on Full Applications is made available to Applicants before the submission deadline for Replies to Reviewer Comments. By providing feedback, EERE intends to guide the further development of the proposed technology and to provide a brief opportunity to respond to reviewer comments.

4. SUCCESSFUL APPLICANTS

A notification letter selecting a Full Application for award negotiations does not authorize the Applicant to commence performance of the project. If an application is selected for award negotiations, it is not a commitment to issue an award. Applicants do not receive an award until award negotiations are complete and the Contracting Officer executes the funding agreement.

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. The Applicant must be responsive during award negotiations (e.g., provide requested documentation) and meet the negotiation deadlines. If the Applicant fails to do so or negotiations are otherwise unsuccessful, EERE will cancel award negotiations and rescind the Selection. EERE reserves the right to terminate award negotiations at any time for any reason.

Please refer to Section IV.I.2 of the FOA for guidance on pre-award costs.

5. POSTPONED SELECTION DETERMINATIONS

A notification letter postponing a final selection determination until a later date does not authorize the Applicant to commence performance of the project. EERE may ultimately determine to select or not select the Full Application for award negotiations.

6. UNSUCCESSFUL APPLICANTS

EERE shall promptly notify in writing each applicant whose application has not been selected for award or whose application cannot be funded because of the unavailability of appropriated funds. If the application was not selected, the written notice shall explain why the application was not selected.

C. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS

1. REGISTRATION REQUIREMENTS

There are several one-time actions before submitting an application in response to this Funding Opportunity Announcement (FOA), and it is vital that applicants address these items as soon as possible. Some may take several weeks, and failure to complete them could interfere with an

applicant's ability to apply to this FOA, or to meet the negotiation deadlines and receive an award if the application is selected. These requirements are as follows:

i. EERE Exchange

Register and create an account on EERE Exchange at https://eere-Exchange.energy.gov. This account will then allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Applicants should also designate backup points of contact so applicants may be easily contacted if deemed necessary. **This step is required to apply to this FOA.**

The EERE Exchange registration does not have a delay; however, **the remaining registration requirements below could take several weeks to process and are necessary for a potential applicant to receive an award under this FOA**. Therefore, although not required in order to submit an application through the EERE Exchange site, all potential applicants lacking a DUNS number, or not yet registered with SAM or FedConnect should complete those registrations as soon as possible.

ii. DUNS Number

Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform.

iii. System for Award Management

Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.

iv. Fedconnect

Register in FedConnect at https://www.fedconnect.net. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/PublicPages/FedConnect_Ready_Set_Go.pdf.

v. Grants.gov

Register in Grants.gov (http://www.grants.gov) to receive automatic updates when Amendments to this FOA are posted. However, please note that Concept Papers, and Full Applications will not be accepted through Grants.gov.

vi. Electronic Authorization of Applications and Award Documents

Submission of an application and supplemental information under this FOA through electronic systems used by the Department of Energy, including EERE Exchange and fedconnect.net, constitutes the authorized representative's approval and electronic signature.

2. *AWARD ADMINISTRATIVE REQUIREMENTS*

The administrative requirements for DOE grants and cooperative agreements are contained in 10 CFR 600, or for awards issued on or after 12/26/2014, the Financial Assistance regulations contained in 2 CFR 200, which will be codified by Chapter IX of 2 CFR (DOE's new financial assistance regulations).

3. *FOREIGN NATIONAL INVOLVEMENT*

All applicants that ultimately enter into an award resulting from this FOA will be subject to the following requirement concerning foreign national involvement. Upon DOE's request, Prime Recipients must provide information to facilitate DOE's responsibilities associated with foreign national access to DOE sites, information, technologies, and equipment. Foreign national is defined as any person who was born outside the jurisdiction of the United States, is a citizen of a foreign government, and has not been naturalized under U.S. law. If the Prime Recipient or subrecipients, contractors or vendors under the award, anticipate utilizing a foreign national person in the performance of an award, the Prime Recipient is responsible for providing to the Contracting Officer specific information of the foreign national(s) to satisfy compliance with all of the requirements for access approval.

4. *LIMITATIONS ON COMPENSATION COSTS*

The annual compensation costs for an individual allowable under this Award are limited to $250,000 (i.e., $250,000 is the maximum amount that EERE will reimburse a Recipient for any one individual's annual compensation and EERE will not recognize such costs above $250,000 as Recipient cost share).

This limitation does not restrict the Recipient or its subrecipients from providing annual compensation to an individual that exceeds $250,000. However, any amount above $250,000 cannot be included in the total project costs (i.e., Federal share or Recipient cost share).

For purposes of this requirement only, the term "annual compensation costs" is defined to include the total amount of wages and salary paid to the employee, which have been approved by the Contracting Officer.

5. *SUBAWARD AND EXECUTIVE REPORTING*

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency Act of 2006 (FFATA) are contained in 2 CFR Part 170. Prime Recipients must register with the new FFATA Subaward Reporting System database and report the required data on their first tier Subrecipients. Prime Recipients must report the executive compensation for their own executives as part of their registration profile in SAM.

6. *NATIONAL POLICY REQUIREMENTS*

The National Policy Assurances that are incorporated as a term and condition of award are located at: http://energy.gov/management/downloads/national-policy-assurances-be-incorporated-award-terms.

7. *ENVIRONMENTAL REVIEW IN ACCORDANCE WITH NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)*

EERE's decision whether and how to distribute federal funds under this FOA is subject to the National Environmental Policy Act (42 USC 4321, *et seq.*). NEPA requires Federal agencies to integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE's NEPA website, at http://nepa.energy.gov/.

While NEPA compliance is a Federal agency responsibility and the ultimate decisions remain with the federal agency, all Recipients selected for an award will be required to assist in the timely and effective completion of the NEPA process in the manner most pertinent to their proposed project.

8. *APPLICANT REPRESENTATIONS AND CERTIFICATIONS*

i. Lobbying Restrictions

By accepting funds under this award, the Recipient agrees that none of the funds obligated on the award shall be expended, directly or indirectly, to influence Congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. §1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

ii. Corporate Felony Conviction and Federal Tax Liability Representations (March 2014)

In submitting an application in response to this FOA, the Applicant represents that:

(1) It is **not** a corporation that has been convicted of a felony criminal violation under any Federal law within the preceding 24 months,

(2) It is **not** a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

For purposes of these representations the following definitions apply:

A Corporation includes any entity that has filed articles of incorporation in any of the 50 states, the District of Columbia, or the various territories of the United States [but not foreign corporations]. It includes both for-profit and non-profit organizations.

9. STATEMENT OF FEDERAL STEWARDSHIP

EERE will exercise normal Federal stewardship in overseeing the project activities performed under EERE Awards. Stewardship Activities include, but are not limited to, conducting site visits; reviewing performance and financial reports, providing assistance and/or temporary intervention in usual circumstances to correct deficiencies that develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the project objectives have been accomplished.

10. STATEMENT OF SUBSTANTIAL INVOLVEMENT

EERE has substantial involvement in work performed under Awards made following this FOA. EERE does not limit its involvement to the administrative requirements of the Award. Instead, EERE has substantial involvement in the direction and redirection of the technical aspects of the project as a whole. Substantial involvement includes, but is not limited to, the following:

1. EERE shares responsibility with the Recipient for the management, control, direction, and performance of the Project.

2. EERE may intervene in the conduct or performance of work under this Award for programmatic reasons. Intervention includes the interruption or modification of the conduct or performance of project activities.

3. EERE may redirect or discontinue funding the Project based on the outcome of EERE's evaluation of the Project at that the Go/No Go decision point.

4. EERE participates in major project decision-making processes.

11. INTELLECTUAL PROPERTY MANAGEMENT PLAN

Within 30 days of selection, Applicants must submit an executed IP Management Plan between the members of the consortia or team.

The award will set forth the treatment of and obligations related to intellectual property rights between EERE and the individual members. The IP Management Plan should describe how the members will handle intellectual property rights and issues between themselves while ensuring compliance with Federal IP laws, regulations, and policies (see Sections VIII.L-VIII.O of this FOA for more details on applicable Federal IP laws and regulations).

The following is a non-exhaustive list of examples of items that the IP Management Plan may cover:

- The treatment of confidential information between members (e.g., the use of non-disclosure agreements);
- The treatment of background IP (e.g., any requirements for identifying it or making it available);
- The treatment of inventions made under the project (e.g., any requirements for disclosing to the other members, filing patent applications, paying for patent prosecution, and cross-licensing or other licensing arrangements between the members);
- The treatment of data produced, including software, under the project (e.g., any publication process or other dissemination strategies, copyrighting strategy or arrangement between members);
- Any technology transfer and commercialization requirements or arrangements between the members;
- The treatment of any intellectual property issues that may arise due to a change in membership of the consortia or team; and
- The handling of disputes related to intellectual property between the members.

12. Subject Invention Utilization Reporting

To ensure that Prime Recipients and Subrecipients holding title to subject inventions are taking the appropriate steps to commercialize subject inventions, EERE requires that each Recipient holding title to a subject invention submit annual reports for 10 years from the date the subject invention was disclosed to EERE on the utilization of the subject invention and efforts made by Recipient or their licensees or assignees to stimulate such utilization. The reports must include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Prime Recipient, and such other data and information as EERE may specify.

13. Intellectual Property Provisions

The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at http://energy.gov/gc/standard-intellectual-property-ip-provisions-financial-assistance-awards.

14. Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to the award agreement. The checklist can be accessed at http://energy.gov/sites/prod/files/2013/05/f0/Attch_FA_RepReqChecklist_COMBINED_FINAL_4-23-13%20%283%29_0.pdf.

15. Go/No-Go Review and Stage-Gate Review

Each project selected under this FOA will be subject to a period project evaluation referred to as a Go/No-Go or Stage Gate Review. Federal funding beyond the Go/No Go or Stage Gate

decision point (continuation funding), is contingent, in part[23], on the outcome of the Go/No Go or Stage Gate Review.

As a result of the Go/No Go or Stage Gate Reviews, DOE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

- **Go/No-Go Decision Points**: Go/No-Go decision points are similar to project milestones, in that EERE staff will review the project based on pre-established metrics defined in the award negotiations process following selection.

- **Stage-Gate Reviews**: Stage-Gate reviews are very similar to Go/No-Go decision points, except that EERE will bring in third parties to assist with validation of project progress. These third parties are typically specialized subject matter experts that will allow EERE to evaluate crucial aspects of project performance with a greater degree of specificity and scrutiny.

VII. QUESTIONS/AGENCY CONTACTS

Upon the issuance of a FOA, EERE personnel are prohibited from communicating (in writing or otherwise) with Applicants regarding the FOA except through the established question and answer process as described below. Specifically, questions regarding the content of this FOA must be submitted to: sishines@ee.doe.gov not later than 3 business days prior to the application due date.

All questions and answers related to this FOA will be posted on EERE Exchange at: https://eere-exchange.energy.gov. **Please note that you must first select this specific FOA Number in order to view the questions and answers specific to this FOA**. EERE will attempt to respond to a question within 3 business days, unless a similar question and answer has already been posted on the website.

Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov.

[23] Continuation funding is contingent on (1) contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) meeting the objectives, milestones, deliverables, decision point criteria, and stage gates of Recipient's approved project and obtaining approval from EERE to continue work on the project; (3) submittal of required reports; and/or (4) compliance with the terms and conditions of the award.

VIII. OTHER INFORMATION

A. FOA MODIFICATIONS

Amendments to this FOA will be posted on the EERE Exchange website and the Grants.gov system. However, you will only receive an email when an amendment or a FOA is posted on these sites if you register for email notifications for this FOA in Grants.gov. EERE recommends that you register as soon after the release of the FOA as possible to ensure you receive timely notice of any amendments or other FOAs.

B. INFORMATIONAL WEBINAR

EERE will conduct one informational webinar during the FOA process. It will be held after the initial FOA release but before the due date for Concept Papers.

The purpose of this webinar is to give applicants a chance to ask questions about the FOA process generally. Attendance is not mandatory and will not positively or negatively impact the overall review of any Applicant submissions. As the webinar will be open to all Applicants who wish to participate, Applicants should refrain from asking questions or communicating information that would reveal confidential and/or proprietary information specific to their project. Specific dates for the webinar can be found on the cover page of the FOA.

C. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE

EERE reserves the right, without qualification, to reject any or all applications received in response to this FOA and to select any application, in whole or in part, as a basis for negotiation and/or award.

D. COMMITMENT OF PUBLIC FUNDS

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by anyone other than the Contracting Officer, either express or implied, is invalid.

E. TREATMENT OF APPLICATION INFORMATION

In general, EERE will use data and other information contained in applications for evaluation purposes only unless such information is generally available to the public or is already the property of the Government.

Applicants should not include trade secrets or commercial or financial information that is privileged or confidential in their application unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the FOA. Applications containing trade secrets or commercial or financial information that is privileged or confidential,

which the applicant does not want disclosed to the public or used by the Government for any purpose other than application evaluation, must be marked as described in this section.

The cover sheet of the application must be marked as follows and identify the specific pages containing trade secrets or commercial or financial information that is privileged or confidential:

> Notice of Restriction on Disclosure and Use of Data:
> Pages [list applicable pages] of this document may contain trade secrets or commercial or financial information that is privileged or confidential, and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source. [End of Notice]

The header and footer of every page that contains trade secrets or commercial or financial information that is privileged or must be marked as follows: "May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure."

In addition, each line or paragraph containing trade secrets or commercial or financial information that is privileged or confidential must be enclosed in brackets.

The above markings enable EERE to follow the provisions of 10 CFR 1004.11(d) in the event a Freedom of Information Act (FOIA) request is received for information submitted with an application. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under a FOIA request or otherwise. The U.S. Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

Subject to the specific FOIA exemptions identified in 5 U.S.C. 552(b), all information submitted to EERE by a FOA applicant is subject to public release under the Freedom of Information Act, 5 U.S.C. §552, as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175. It is the applicant's responsibility to review FOIA and its exemptions to understand (1) what information may be subject to public disclosure and (2) what information applicants submit to the Government that are protected by law. In some cases, DOE may be unable to make an independent determination regarding which information submitted by an applicant is releasable and which is protected by an exemption. In such cases, DOE will consult with the applicant, in accordance with 10 C.F.R. §1004.11, to solicit the applicant's views on how the information should be treated.

F. EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL

In conducting the merit review evaluation, the Government may seek the advice of qualified non Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

G. Notice Regarding Eligible/Ineligible Activities

Eligible activities under this Technology Office include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

H. Notice of Right to Conduct a Review of Financial Capability

EERE reserves the right to conduct an independent third party review of financial capability for applicants that are selected for negotiation of award (including personal credit information of principal(s) of a small business if there is insufficient information to determine financial capability of the organization).

I. Notice of Potential Disclosure Under Freedom of Information Act

Applicants should be advised that identifying information regarding all applicants, including applicant names and/or points of contact, may be subject to public disclosure under the Freedom of Information Act, whether or not such applicants are selected for negotiation of award.

J. Requirement for Full and Complete Disclosure

Applicants are required to make a full and complete disclosure of all information requested. Any failure to make a full and complete disclosure of the requested information may result in:

- The rejection of a Concept Paper, Full Application, and/or Reply to Reviewer Comments;
- The termination of award negotiations;
- The modification, suspension, and/or termination of a funding agreement;
- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of Federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

K. Retention of Submissions

EERE expects to retain copies of all Concept Papers, Full Applications, Replies to Reviewer Comments, and other submissions. No submissions will be returned. By applying to EERE for funding, Applicants consent to EERE's retention of their submissions.

L. TITLE TO SUBJECT INVENTIONS

Ownership of subject inventions is governed pursuant to the authorities listed below.

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions.

- All other parties: The Federal Non-Nuclear Energy Act of 1974, 42. U.S.C. 5908, provides that the Government obtains title to new inventions unless a waiver is granted (see below).

- Class Patent Waiver:

  DOE has issued a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan are sufficient.

- Advance and Identified Waivers: Applicants may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to EERE within the timeframes set forth in the award's intellectual property terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784.

- Determination of Exceptional Circumstances (DEC): Each applicant is required to submit a U.S. Manufacturing Plan as part of its application. If selected, the U.S. Manufacturing Plan shall be incorporated into the award terms and conditions. DOE has determined that exceptional circumstances exist that warrants the modification of the standard patent rights clause for small businesses and non-profit awardees under Bayh-Dole to the extent necessary to implement and enforce the U.S. Manufacturing Plan. For example, the commitments and enforcement of a U.S. Manufacturing Plan may be tied to subject inventions. Any Bayh-Dole entity (domestic small business or nonprofit organization) affected by this DEC has the right to appeal it.

M. GOVERNMENT RIGHTS IN SUBJECT INVENTIONS

Where Recipients and Subrecipients retain title to subject inventions, the U.S. Government retains certain rights.

1. GOVERNMENT USE LICENSE

The U.S. Government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world. This license extends to contractors doing work on behalf of the Government.

2. MARCH-IN RIGHTS

The U.S. Government retains march-in rights with respect to all subject inventions. Through "march-in rights," the Government may require a Prime Recipient or Subrecipient who has elected to retain title to a subject invention (or their assignees or exclusive licensees), to grant a license for use of the invention to a third party. In addition, the Government may grant licenses for use of the subject invention when a Prime Recipient, Subrecipient, or their assignees and exclusive licensees refuse to do so.

DOE may exercise its march-in rights only if it determines that such action is necessary under any of the four following conditions:

- The owner or licensee has not taken or is not expected to take effective steps to achieve practical application of the invention within a reasonable time;
- The owner or licensee has not taken action to alleviate health or safety needs in a reasonably satisfied manner;
- The owner has not met public use requirements specified by Federal statutes in a reasonably satisfied manner; or
- The U.S. Manufacturing requirement has not been met.

- Any determination that march-in rights are warranted must follow a fact-finding process in which the recipient has certain rights to present evidence and witnesses, confront witnesses and appear with counsel and appeal any adverse decision. To date, DOE has never exercised its march-in rights to any subject inventions.

N. RIGHTS IN TECHNICAL DATA

Data rights differ based on whether data is first produced under an award or instead was developed at private expense outside the award.

"Limited Rights Data": The U.S. Government will not normally require delivery of confidential or trade secret-type technical data developed solely at private expense prior to issuance of an award, except as necessary to monitor technical progress and evaluate the potential of proposed technologies to reach specific technical and cost metrics.

Government rights in Technical Data Produced Under Awards: The U.S. Government normally retains unlimited rights in technical data produced under Government financial assistance awards, including the right to distribute to the public. However, pursuant to special statutory authority, certain categories of data generated under EERE awards may be protected from public disclosure for up to five years after the data is generated ("Protected Data"). For awards permitting Protected Data, the protected data must be marked as set forth in the awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

O. COPYRIGHT

The Prime Recipient and Subrecipients may assert copyright in copyrightable data, such as software, first produced under the award without EERE approval. When copyright is asserted, the Government retains a paid-up nonexclusive, irrevocable worldwide license to reproduce, prepare derivative works, distribute copies to the public, and to perform publicly and display publicly the copyrighted work. This license extends to contractors and others doing work on behalf of the Government

P. PROTECTED PERSONALLY IDENTIFIABLE INFORMATION

In responding to this FOA, Applicants must ensure that Protected Personally Identifiable Information (PII) is not included in the following documents: Project Abstract, Project Narrative, Biographical Sketches, Budget or Budget Justification. These documents will be used by the Merit Review Committee in the review process to evaluate each application. PII is defined by the Office of Management and Budget (OMB) and EERE as:

Any information about an individual maintained by an agency, including but not limited to, education, financial transactions, medical history, and criminal or employment history and information that can be used to distinguish or trace an individual's identity, such as their name, social security number, date and place of birth, mother's maiden name, biometric records, etc., including any other personal information that is linked or linkable to an individual.

This definition of PII can be further defined as: (1) Public PII and (2) Protected PII.

Public PII: PII found in public sources such as telephone books, public websites, business cards, university listing, etc. Public PII includes first and last name, address, work telephone number, email address, home telephone number, and general education credentials.

Protected PII: PII that requires enhanced protection. This information includes data that if compromised could cause harm to an individual such as identity theft.

Listed below are examples of Protected PII that Applicants must not include in the files listed above to be evaluated by the Merit Review Committee.

- Social Security Numbers in any form
- Place of Birth associated with an individual
- Date of Birth associated with an individual
- Mother's maiden name associated with an individual
- Biometric record associated with an individual
- Fingerprint
- Iris scan
- DNA
- Medical history information associated with an individual
- Medical conditions, including history of disease
- Metric information, e.g. weight, height, blood pressure
- Criminal history associated with an individual
- Employment history and other employment information associated with an individual
- Ratings
- Disciplinary actions
- Performance elements and standards (or work expectations) are PII when they are so intertwined with performance appraisals that their disclosure would reveal an individual's performance appraisal
- Financial information associated with an individual
- Credit card numbers
- Bank account numbers
- Security clearance history or related information (not including actual clearances held)

Listed below are examples of Public PII that Applicants may include in the files listed above to be evaluated by the Merit Review Committee:

- Phone numbers (work, home, cell)
- Street addresses (work and personal)
- Email addresses (work and personal)
- Digital pictures
- Medical information included in a health or safety report
- Employment information that is not PII even when associated with a name
- Resumes, unless they include a Social Security Number
- Present and past position titles and occupational series
- Present and past grades
- Present and past annual salary rates (including performance awards or bonuses, incentive awards, merit pay amount, Meritorious or Distinguished Executive Ranks, and allowances and differentials)

- Present and past duty stations and organization of assignment (includes room and phone numbers, organization designations, work email address, or other identifying information regarding buildings, room numbers, or places of employment)
- Position descriptions, identification of job elements, and those performance standards (but not actual performance appraisals) that the release of which would not interfere with law enforcement programs or severely inhibit agency effectiveness
- Security clearances held
- Written biographies (e.g. to be used in a Technology Office describing a speaker)
- Academic credentials
- Schools attended
- Major or area of study
- Personal information stored by individuals about themselves on their assigned workstation or laptop unless it contains a Social Security Number

Q. ANNUAL COMPLIANCE AUDITS

If a for-profit entity is a Prime Recipient and has expended greater than $500K of DOE funds in a respective fiscal year, an annual compliance audit performed by an independent auditor is required. For additional information, please refer to 10 C.F.R. § 600.316 and for-profit audit guidance documents posted under the "Coverage of Independent Audits" heading at http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms.

If an educational institution, non-profit organization, or state/local government is a Prime Recipient or Subrecipient and has expended greater than $500K of Federal funds in a respective fiscal year, then an A-133 audit is required. For additional information, please refer to OMB Circular A-133 through the link below.
http://www.whitehouse.gov/sites/default/files/omb/assets/omb/circulars/a133/a133.pdf.

Applicants and sub-recipients (if applicable) should propose sufficient costs in the project budget to cover the costs associated with the audit. EERE will share in the cost of the audit at its applicable cost share ratio.

APPENDIX A – DEFINITIONS

"**Applicant**" means the legal entity or individual signing the Application. This entity or individual may be one organization or a single entity representing a group of organizations (such as a Consortium) that has chosen to submit a single Application in response to a FOA.

"**Application**" means the documentation submitted in response to a FOA.

"**Authorized Organization Representative (AOR)**" is the person with assigned privileges who is authorized to submit grant applications through Grants.gov on behalf of an organization. The privileges are assigned by the organization's E-Business Point of Contact designated in the SAM.

"**Award**" means the written documentation executed by a Contracting Officer, after an Applicant is selected, which contains the negotiated terms and conditions for providing Financial Assistance to the Applicant. A Financial Assistance Award may be a Grant, Cooperative Agreement, or Technology Investment Agreement.

"**Budget**" means the cost expenditure plan submitted in the Application, including both the EERE contribution and the Applicant Cost Share.

"**Compliance**" is an eligibility determination that refers to the non-technical requirements outlined in a FOA (e.g., formatting, timeliness of submission, or satisfaction of prerequisites).

"**Consortium (plural consortia)**" means the group of organizations or individuals that have chosen to submit a single Application in response to a FOA.

"**Contracting Officer**" means the EERE official authorized to execute Awards on behalf of EERE and who is responsible for the business management and non-Technology Office aspects of the Financial Assistance process.

"**Cooperative Agreement**" means a Financial Assistance instrument used by EERE to transfer money or property when the principal purpose of the transaction is to accomplish a public purpose of support or stimulation authorized by Federal statute, and Substantial Involvement (see definition below) is anticipated between EERE and the Applicant during the performance of the contemplated activity. Refer to 10 CFR 600.5 for additional information regarding cooperative agreements.

"**Cost Sharing**" means that portion of the project or program's costs not borne by the Federal Government. The percentage of Applicant Cost Share is to be applied to the Total Project Cost (i.e., the sum of Applicant plus EERE Cost Shares) rather than to the EERE contribution alone. Cost sharing information can be found in the Code of Federal Regulations at 10 CFR 600.123 (non-profit and university), 600.224 (State and Local Governments), and 600.313 (for profit entities).

"**Data Universal Numbering System (DUNS) Number**" is a unique nine-character identification number issued by Dun and Bradstreet (D&B). Organizations must have a DUNS number prior to registering in the SAM. Call 1-866-705-5711 to receive one free of charge.

"**E-Business Point of Contact (POC)**" is the individual who is designated as the Electronic Business Point of Contact in the SAM registration. This person is the sole authority of the organization with the capability of designating or revoking an individual's ability to conduct SAM transactions.

"**EERE Exchange**" is the Department of Energy, Energy Efficiency and Renewable Energy's web system for posting Federal FOAs and receiving applications. EERE Exchange may be found at https://eere-exchange.energy.gov.

"**Financial Assistance**" means the transfer of money or property to an Applicant or Participant to accomplish a public purpose of support authorized by Federal statute through Grants or Cooperative Agreements and sub-awards. For EERE, it does not include direct loans, loan guarantees, price guarantees, purchase agreements, Cooperative Research and Development Agreements (CRADAs), or any other type of financial incentive instrument.

"**FedConnect**" is where federal agencies make awards via the web. It can be found at https://www.fedconnect.net/FedConnect/.

"**Federally Funded Research and Development Center (FFRDC)**" means a government-sponsored operation that exists for the purpose of carrying out various functions related to both basic and applied research and development on behalf of the Government. Typically, most or all of the facilities utilized in an FFRDC are owned by the Government, but the operations are not always managed by the Government; an FFRDC may be managed by a University or consortium of Universities, other not-for-profit or nonprofit organization, or a for-profit organization, with the Government performing an oversight function.

"**Funding Opportunity Announcement (FOA)**" is a publicly available document by which a Federal agency makes known its intentions to award discretionary grants or cooperative agreements, usually as a result of competition for funds. FOAs may be known as FOAs, notices of funding availability, solicitations, or other names depending on the agency and type of program. See 10 CFR 600.8 for more information.

"**Grant**" means a Financial Assistance instrument used by EERE to transfer money or property when the principal purpose of the transaction is to accomplish a public purpose of support or stimulation authorized by Federal statute, and no Substantial Involvement is anticipated between EERE and the Applicant during the performance of the contemplated activity.

"**Grants.gov**" is the "storefront" web portal which allows organizations to electronically find grant opportunities from all Federal grant-making agencies. Grants.gov is THE single access point for over 900 grant programs offered by the 26 Federal grant-making agencies. It can be accessed at http://www.grants.gov.

"**Indian Tribe**" means any Indian tribe, band, nation, or other organized group or community, including Alaska Native village or regional or village corporation, as defined in or established pursuant to the Alaska Native Claims Settlement Act (85 Stat. 688)[43 U.S.C. § 1601 et seq.], which are recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

"**Key Personnel**" mean the individuals who will have significant roles in planning and implementing the proposed Project on the part of the Applicant and Participants, including FFRDCs.

"**Marketing Partner Identification Number (MPIN)**" is a very important password designated by your organization when registering in SAM. The E-Business Point of Contact will need the MPIN to assign privileges to the individual(s) authorized to perform SAM transactions on behalf of your organization. The MPIN must have 9 digits containing at least one alpha character (must be in capital letters) and one number (no spaces or special characters permitted).

"**Modification**" means a revision to a FOA.

"**Participant**" for purposes of this FOA only, means any entity, except the Applicant substantially involved in a Consortium, or other business arrangement (including all parties to the Application at any tier), responding to the FOA.

"**Principal Investigator**" refers to the technical point of contact/Project Manager for a specific project award.

"**Project**" means the set of activities described in an Application, State plan, or other document that is approved by EERE for Financial Assistance (whether such Financial Assistance represents all or only a portion of the support necessary to carry out those activities).

"**Project Team**" means the team which consists of the Prime Recipient, Subrecipients, and others performing or otherwise supporting work under an EERE funding agreement.

"**Proposal**" is the term used to describe the documentation submitted in response to a FOA. Also see Application.

"**Prime Recipient**" means the organization, individual, or other entity that receives a Financial Assistance Award from EERE (i.e., is the signatory on the award), is financially accountable for the use of any EERE funds or property provided for the performance of the Project, and is legally responsible for carrying out the terms and condition of the award.

"**Responsiveness**" is an eligibility determination that refers to the objective technical requirements (not goals or targets) outlined in a FOA, such as a technology type or technical parameters. For example, submission of a photovoltaic solar panel design in response to a FOA calling for innovative geothermal drilling technologies should be found nonresponsive. Likewise, an application with a design that incorporates rare earth materials to a FOA that prohibits the use

of rare earth materials should be found nonresponsive. Conversely, the belief that a technology will not achieve the technical targets of the FOA will never be used as a proper basis for a rejection as nonresponsive.

"**System for Award Management (SAM)**" is the primary database which collects, validates, stores and disseminates data in support of agency missions. It can be accessed at https://www.sam.gov.

"**Selection**" means the determination by the EERE Selection Official that negotiations take place for certain Projects with the intent of awarding a Financial Assistance instrument.

"**Selection Official**" means the EERE official designated to select Applications for negotiation toward Award under a subject FOA.

"**Substantial Involvement**" means involvement on the part of the Government. EERE's involvement may include shared responsibility for the performance of the Project; providing technical assistance or guidance which the Applicant is to follow; and the right to intervene in the conduct or performance of the Project. Such involvement will be negotiated with each Applicant prior to signing any agreement.

"**Technology Investment Agreement (TIA)**" is a type of assistance instrument used to support or stimulate research projects involving for-profit firms, especially commercial firms that do business primarily in the commercial marketplace. TIAs are different from grants and cooperative agreements in that the award terms may vary from the Government-wide standard terms (See DOE TIA regulations at 10 CFR Part 603). The primary purposes for including a TIA in the type of available award instruments are to encourage non-traditional Government contractors to participate in an R&D program and to facilitate new relationships and business practices. A TIA can be particularly useful for awards to consortia (See 10 CFR 603.225(b) and 603.515, Qualification of a consortium).

"**Total Project Cost**" means all the funds to complete the effort proposed by the Applicant, including EERE funds (including direct funding of any FFRDC) plus all other funds that will be committed by the Applicant as Cost Sharing.

"**Tribal Energy Resource Development Organization**" means an "organization" of two or more entities, at least one of which is an Indian Tribe (see "Indian Tribe" above) that has the written consent of the governing bodies of all Indian Tribes participating in the organization to apply for a grant or loan, or other assistance under 25 U.S.C. § 3503.

APPENDIX B – COST SHARE INFORMATION

Cost Sharing or Cost Matching

The terms "cost sharing" and "cost matching" are often used synonymously. Even the DOE Financial Assistance Regulations, 10 CFR Part 600, use both of the terms in the titles specific to regulations applicable to cost sharing. EERE almost always uses the term "cost sharing," as it conveys the concept that non-federal share is calculated as a percentage of the Total Project Cost. An exception is the State Energy Program Regulation, 10 CFR 420.12, State Matching Contribution. Here "cost matching" for the non-federal share is calculated as a percentage of the Federal funds only, rather than the Total Project Cost.

How Cost Sharing Is Calculated

As stated above, cost sharing is calculated as a percentage of the Total Project Cost. Following is an example of how to calculate cost sharing amounts for a project with $1,000,000 in federal funds with a minimum 20% non-federal cost sharing requirement:

- Formula: Federal share ($) divided by Federal share (%) = Total Project Cost
  Example: $1,000,000 divided by 80% = $1,250,000

- Formula: Total Project Cost ($) minus Federal share ($) = Non-federal share ($)
  Example: $1,250,000 minus $1,000,000 = $250,000

- Formula: Non-federal share ($) divided by Total Project Cost ($) = Non-federal share (%)
  Example: $250,000 divided by $1,250,000 = 20%

See the sample cost share calculation for a blended cost share percentage below. Keep in mind that FFRDC funding is DOE funding.

What Qualifies For Cost Sharing

While it is not possible to explain what specifically qualifies for cost sharing in one or even a couple of sentences, in general, if a cost is allowable under the cost principles applicable to the organization incurring the cost and is eligible for reimbursement under an EERE grant or cooperative agreement, then it is allowable as cost share. Conversely, if the cost is not allowable under the cost principles and not eligible for reimbursement, then it is not allowable as cost share. In addition, costs may not be counted as cost share if they are paid by the Federal Government under another award unless authorized by Federal statute to be used for cost sharing.

The rules associated with what is allowable as cost share are specific to the type of organization that is receiving funds under the grant or cooperative agreement, though are generally the same for all types of entities. The specific rules applicable to:

- Institutions of Higher Education, Hospitals, and Other Nonprofit Organizations are found at 10 CFR 600.123;
- State and Local Governments are found at 10 CFR 600.224;
- For-profit Organizations are found at 10 CFR 600.313.

In addition to the regulations referenced above, other factors may also come into play such as timing of donations and length of the project period. For example, the value of ten years of donated maintenance on a project that has a project period of five years would not be fully allowable as cost share. Only the value for the five years of donated maintenance that corresponds to the project period is allowable and may be counted as cost share.

Additionally, EERE generally does not allow pre-award costs for either cost share or reimbursement when these costs precede the signing of the appropriation bill that funds the award. In the case of a competitive award, EERE generally does not allow pre-award costs prior to the signing of the Selection Statement by the EERE Selection Official.

Following is a link to the DOE Financial Assistance Regulations. You can click on the specific section for each Code of Federal Regulations reference mentioned above.

DOE Financial Assistance Rules (10 CFR 600)

As stated above, the rules associated with what is allowable cost share are generally the same for all types of organizations. Following are the rules found to be common, but again, the specifics are contained in the regulations and cost principles specific to the type of entity:

(A) Acceptable contributions. All contributions, including cash contributions and third party in-kind contributions, must be accepted as part of the Prime Recipient's cost sharing if such contributions meet all of the following criteria:

(1) They are verifiable from the recipient's records.

(2) They are not included as contributions for any other federally-assisted project or program.

(3) They are necessary and reasonable for proper and efficient accomplishment of project or program objectives.

(4) They are allowable under the cost principles applicable to the type of entity incurring the cost as follows:

a. For-profit organizations. Allowability of costs incurred by for-profit organizations and those nonprofit organizations listed in Attachment C to OMB Circular A–122 is determined in accordance with the for-profit cost principles in 48 CFR Part 31 in the Federal Acquisition Regulation, except that patent prosecution costs are not allowable unless specifically authorized in the award document. (v) Commercial Organizations. FAR Subpart 31.2—Contracts with Commercial Organizations

b. Other types of organizations. Allowability of costs incurred by other types of organizations that may be Subrecipients under a prime award is determined as follows:

i. Institutions of higher education. Allowability is determined in accordance with: 2 CFR 220 Cost Principles for Educational Institutions

ii. Other nonprofit organizations. Allowability is determined in accordance with: 2 CFR 230 Cost Principles for Nonprofit Organizations

iii. Hospitals. Allowability is determined in accordance with the provisions of: Title 45 Appendix E to Part 74—Principles for Determining Costs Applicable to Research and Development Under Grants and Contracts With Hospitals

iv. Governmental organizations. Allowability for State, local, or federally recognized Indian tribal government is determined in accordance with: PART 225—Cost Principles for State, Local, and Indian Tribal Governments (OMB Circular A–87)

(5) They are not paid by the Federal Government under another award unless authorized by Federal statute to be used for cost sharing or matching.

(6) They are provided for in the approved budget.

(B) Valuing and documenting contributions

(1) Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that amounts chargeable to the project are determined on the basis of costs incurred. For real property or equipment used on the project, the cost principles authorize depreciation or use charges. The full value of the item may be applied when the item will be consumed in the performance of the award or fully depreciated by the end of the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

a. The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or
b. The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.

(2) Valuing services of others' employees. If an employer other than the recipient furnishes the services of an employee, those services are valued at the employee's regular rate of pay, provided these services are for the same skill level for which the employee is normally paid.

(3) Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as cost sharing or matching if the service is an integral and necessary part of an approved project or program. Rates for volunteer services must be consistent with those paid for similar work in the recipient's organization. In those markets in which the required skills are not found in the recipient organization, rates must be consistent with those paid for similar work in the labor market in which the recipient competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.

(4) Valuing property donated by third parties.

a. Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the cost sharing or matching share must be reasonable and must not exceed the fair market value of the property at the time of the donation.

b. Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:

i. The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of comparable space and facilities in a privately-owned building in the same locality.

ii. The value of loaned equipment must not exceed its fair rental value.

(5) Documentation. The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:

a. Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.

b. The basis for determining the valuation for personal services and property must be documented.

APPENDIX C – SAMPLE COST SHARE CALCULATION FOR BLENDED COST SHARE PERCENTAGE

The following example shows the math for calculating required cost share for a project with $2,000,000 in Federal funds with four tasks requiring different Non-federal cost share percentages:

Task	Proposed Federal Share	Federal Share %	Recipient Share %
Task 1 (R&D)	$1,000,000	80%	20%
Task 2 (R&D)	$500,000	80%	20%
Task 3 (Demonstration)	$400,000	50%	50%
Task 4 (Outreach)	$100,000	100%	0%

Federal share ($) divided by Federal share (%) = Task Cost

Each task must be calculated individually as follows:

Task 1
$1,000,000 divided by 80% = $1,250,000 (Task 1 Cost)
Task 1 Cost minus federal share = Non-federal share
$1,250,000 - $1,000,000 = $250,000 (Non-federal share)

Task 2
$500,000 divided 80% = $625,000 (Task 2 Cost)
Task 2 Cost minus federal share = Non-federal share
$625,000 - $500,000 = $125,000 (Non-federal share)

Task 3
$400,000 / 50% = $800,000 (Task 3 Cost)
Task 3 Cost minus federal share = Non-federal share
$800,000 - $400,000 = $400,000 (Non-federal share)

Task 4
Federal share = $100,000
Non-federal cost share is not mandated for outreach = $0 (Non-federal share)

The calculation may then be completed as follows:

Tasks	$ Federal Share	% Federal Share	$ Non-Federal Share	% Non-Federal Share	Total Project Cost
Task 1	$1,000,000	80%	$250,000	20%	$1,250,000
Task 2	$500,000	80%	$125,000	20%	$625,000
Task 3	$400,000	50%	$400,000	50%	$800,000
Task 4	$100,000	100%	$0	0%	$100,000
Totals	$2,000,000		$775,000		$2,775,000

Blended Cost Share %
Non-federal share ($775,000) divided by Total Project Cost ($2,775,000) = 27.9% (Non-federal)
Federal share ($2,000,000) divided by Total Project Cost ($2,775,000) = 72.1% (Federal)

APPENDIX D - DATA MANAGEMENT PLANS

A data management plan ("DMP") explains how data generated in the course of the work performed under an EERE award will be shared and preserved or, when justified, explains why data sharing or preservation is not possible or scientifically appropriate.

DMP Requirements

In order for a DMP to be considered acceptable, the DMP must address the following:

> **At a minimum, the DMP must describe how data sharing and preservation will enable validation of the results from the proposed work, or how results could be validated if data are not shared or preserved**.
>
> **The DMP must provide a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publication.** This includes data that are displayed in charts, figures, images, etc. In addition, the underlying digital research data used to generate the displayed data should be made as accessible as possible in accordance with the principles stated above. This requirement could be met by including the data as supplementary information to the published article, or through other means. The published article should indicate how these data can be accessed.
>
> The DMP should consult and reference available information about data management resources to be used in the course of the proposed work. In particular, a DMP that explicitly or implicitly commits data management resources at a facility beyond what is conventionally made available to approved users should be accompanied by written approval from that facility. In determining the resources available for data management at DOE User Facilities, researchers should consult the published description of data management resources and practices at that facility and reference it in the DMP. Information about other DOE facilities can be found in the additional guidance from the sponsoring program.
>
> The DMP must protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; avoid significant negative impact on innovation, and U.S. competitiveness; and otherwise be consistent with all laws (e.g., export control laws), and DOE regulations, orders, and policies.

Data Determination for a DMP

The Principal Investigator should determine which data should be the subject of the DMP and, in the DMP, propose which data should be shared and/or preserved in accordance with the DMP Requirements noted above.

For data that will be generated through the course of the proposed work, the Principal Investigator should indicate what types of data should be protected from immediate public disclosure by DOE (referred to as "protected data") and what types of data that DOE should be able to release immediately. Similarly, for data developed outside of the proposed work at private expense that will be used in the course of the proposed work, the Principal Investigator should indicate whether that type of data will be subject to public release or kept confidential (referred to as "limited rights data"). Any use of limited rights data or labeling of data as "protected data" must be consistent with the DMP Requirements noted above.

Suggested Elements for a DMP

The following list of elements for a DMP provides suggestions regarding the data management planning process and the structure of the DMP:

Data Types and Sources: A brief, high-level description of the data to be generated or used through the course of the proposed work and which of these are considered digital research data necessary to validate the research findings or results.

Content and Format: A statement of plans for data and metadata content and format including, where applicable, a description of documentation plans, annotation of relevant software, and the rationale for the selection of appropriate standards. Existing, accepted community standards should be used where possible. Where community standards are missing or inadequate, the DMP could propose alternate strategies for facilitating sharing, and should advise the sponsoring program of any need to develop or generalize standards.

Sharing and Preservation: A description of the plans for data sharing and preservation. This should include, when appropriate: the anticipated means for sharing and the rationale for any restrictions on who may access the data and under what conditions; a timeline for sharing and preservation that addresses both the minimum length of time the data will be available and any anticipated delay to data access after research findings are published; any special requirements for data sharing, for example, proprietary software needed to access or interpret data, applicable policies, provisions, and licenses for re-use and re-distribution, and for the production of derivatives, including guidance for how data and data products should be cited; any resources and capabilities (equipment, connections, systems, software, expertise, etc.) requested in the research proposal that are needed to meet the stated goals for sharing and preservation (this could reference the relevant section of the associated research proposal and budget request); and whether/where the data will be preserved after direct project funding ends and any plans for the transfer of responsibilities for sharing and preservation.

Protection: A statement of plans, where appropriate and necessary, to protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; and avoid significant negative impact on innovation, and U.S. competitiveness.

Rationale: A discussion of the rationale or justification for the proposed data management plan including, for example, the potential impact of the data within the immediate field and in other fields, and any broader societal impact.

Additional Guidance

In determining which data should be shared and preserved, researchers must consider the data needed to validate research findings as described in the Requirements, and are encouraged to consider the potential benefits of their data to their own fields of research, fields other than their own, and society at large.

DMPs should reflect relevant standards and community best practices and make use of community accepted repositories whenever practicable.

Costs associated with the scope of work and resources articulated in a DMP may be included in the proposed research budget as permitted by the applicable cost principles.

To improve the discoverability of and attribution for datasets created and used in the course of research, EERE encourages the citation of publicly available datasets within the reference section of publications, and the identification of datasets with persistent identifiers such as Digital Object Identifiers (DOIs). In most cases, EERE can provide DOIs free of charge for data resulting from DOE-funded research through its Office of Scientific and Technical Information (OSTI) DataID Service.

Definitions

Data Preservation: Data preservation means providing for the usability of data beyond the lifetime of the research activity that generated them.

Data Sharing: Data sharing means making data available to people other than those who have generated them. Examples of data sharing range from bilateral communications with colleagues, to providing free, unrestricted access to anyone through, for example, a web-based platform.

Digital Research Data: The term digital data encompasses a wide variety of information stored in digital form including: experimental, observational, and simulation data; codes, software and algorithms; text; numeric information; images; video; audio; and associated metadata. It also encompasses information in a variety of different forms including raw, processed, and analyzed data, published and archived data.

Research Data: The recorded factual material commonly accepted in the scientific community as necessary to validate research findings, but not any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, or communications with colleagues. This 'recorded' material excludes physical objects (e.g., laboratory samples). Research data also do not include:

(A) Trade secrets, commercial information, materials necessary to be held confidential by a researcher until they are published, or similar information which is protected under law; and

(B) Personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy, such as information that could be used to identify a particular person in a research study."

Validate: In the context of DMPs, validate means to support, corroborate, verify, or otherwise determine the legitimacy of the research findings. Validation of research findings could be accomplished by reproducing the original experiment or analyses; comparing and contrasting the results against those of a new experiment or analyses; or by some other means.