DuraMat Consortium Call for Proposals
Amendment No. 001

DATE: May 10, 2016
TO: All Prospective Applicants

SUBJECT: Amendment No. 001 to DuraMat Consortium Call for Proposals

I. The purpose of this amendment is to:

a. Revise Section 2 of the Call for Proposals as shown below:

Eligibility: All DOE/NNSA Federally Funded Research and Development Centers (FFRDCs), which are Government-Owned, Government-Operated laboratories (GOGOs) or Government- Owned, Contractor-Operated laboratories (GOCOs), are eligible to submit proposals as prime awardees, unless specified otherwise. A principle investigator (PI) is allowed to submit only one proposal, though she/he may be included as a team member on other proposals.

b. Revise Section 3B of the Call for Proposals as shown below:

Proposals must conform to the following requirements for format and content:

1. Each Proposal must be submitted as a single PDF document no longer than 10 pages in total (per the content instructions below), exclusive of a 1-page Cover Page and an appendix of 2-page resumes. If proposals are over the page length, EERE staff may redact extra pages. If proposals are non-compliant because the proposal did not meet other requirements, staff will deem such proposals ineligible for review, and therefore such proposals will not be eligible to submit a Detailed Consortium Description.

c. Revise Section 3D of the Call for Proposals as shown below:

D. **Detailed Consortium Description Requirements**

II. All other parts of the Funding Opportunity Announcement remain unchanged.

III. All edits are highlighted in yellow to clearly call attention to the revisions that have been made.

Durable Module Materials (DuraMat) Energy Materials Network (EMN) Consortium Call for Proposals

Amendment 001

Solar Energy Technologies Office
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

www.solar.energy.gov

Summary of Key Dates

Call for Proposals released	May 6, 2016
Proposals due (5:00 PM ET)	June 17, 2016
Pre-selection interviews (anticipated)	June 27-28, 2016
Proposal notifications sent to PIs (anticipated)	July 8-15, 2016
Award negotiations complete (anticipated)	September 1, 2016

Executive Summary

Means of Submission	Proposals should be emailed to SunShot.EMN@ee.doe.gov by 5:00 PM EDT on June 17, 2016.
Anticipated Total Amount to be Awarded	One $30,000,000 award
Period of Performance	5 years
Eligible Applicants	FFRDCs as prime applicant
Cost Share Requirement	10% of Total Project Costs
Call for Proposals Summary	With module materials already accounting for 40% or more of the total PV module costs, substantial opportunities exist for durable, high-performance, low-cost module and packaging materials. In order to accelerate module materials discovery and development, SunShot is making $30 million available to fund a national laboratory-led Energy Materials Network (EMN) Consortium. The durable module materials (DuraMat) EMN Consortium will lower the levelized cost of solar generated electricity by driving innovation across materials design, data informatics, high-throughput synthesis and characterization, as well as durability testing of materials and components through the integration of national lab, university, and PV industry capabilities.

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Section 1. Call for Proposals Description

A. Summary of DuraMat Consortium

This Call for Proposals is intended to establish a national laboratory-led Energy Materials Network (EMN) Consortium for durable module materials (DuraMat) aimed at dramatically accelerating the development of new module materials that enable significant reductions in the levelized cost of energy (LCOE) of photovoltaic (PV) systems. It is envisioned that the DuraMat EMN Consortium will develop durable, high-performance, low-cost PV module packaging materials, as well as enable innovation in PV module form factors in order to meet and exceed the current SunShot LCOE metrics. Such systems would reduce the cost of PV-generated energy, improve the performance and energy output of existing and future cell and module technologies, and enhance the durability and lifetime of PV modules, ultimately increasing U.S. innovation and competitiveness in the PV module materials supply chain and PV module manufacturing

Proposals are sought from teams led by a single national laboratory that will establish the technical and managerial structure for the DuraMat Consortium and enable it to reach the following objectives:

- Define an overarching technical goal or set of goals that will enable dramatic reductions in solar LCOE (e.g., to 3 cents per kWh by 2030).
- Establish and develop a network of unique capabilities and collaborations across national laboratories, academia, and industry that focus on high throughput materials design, development, and deployment in the area of durable module materials. These capabilities could include high-throughput and application-driven theory and simulation methods; advanced characterization of materials, characterization of component durability; rapid and high throughput synthesis and deposition methods; and materials and component testing in mini-modules and testing platforms.
- Enable interdisciplinary approaches to materials and component development through improved understanding of the multi-scale factors that impact the durability and performance of PV systems as well as defining the component and material constraints to design against.
- Provide a common platform and format for data from the Consortium to be shared, accessed, and mined for internal and external use.
- Utilize a single point of contact along with a streamlined process for improving national lab engagement with the solar industry, thereby serving to dramatically accelerate the development and deployment of new and relevant module solutions.
- Facilitate rapid completion of agreements for project teams, such as intellectual property (IP) and non-disclosure agreements (NDAs) to eliminate tech transfer as a rate-limiting step to progress.
- Develop the next-generation workforce in durable, high performance PV modules and materials.

B. The SunShot Initiative

The U.S. Department of Energy's Solar Energy Technologies Office and the SunShot Initiative work to accelerate the market competitiveness of solar energy by reducing the levelized cost of energy (LCOE) and enabling greater solar deployment. The SunShot Initiative set an LCOE goal of $0.06/kWh by 2020 without subsidies for electricity generated from utility-scale solar technologies (in regions with average solar resource). This is an ambitious goal that, if achieved, would make solar electricity cost competitive with conventional electricity sources at low penetrations of solar on the grid. While progress in the PV field to date has been remarkable, further advances are needed to reach the SunShot LCOE targets. Additionally, even after the SunShot targets are achieved, the price of electricity from photovoltaics must continue to decline substantially (e.g. targeting $0.03/kWh by 2030) to enable the continued rapid penetration of variable PV resources into national electricity markets.[1]

Figure 1 provides a graphical representation of the basic strategy of SunShot's photovoltaics research and development program[2]. The photovoltaics research and development program is responsible for supporting the SunShot mission through the advancement of cell, module, and system-level technologies to enable cost-effective PV-generated electricity and to strengthen national PV research competitiveness now and for decades to come.

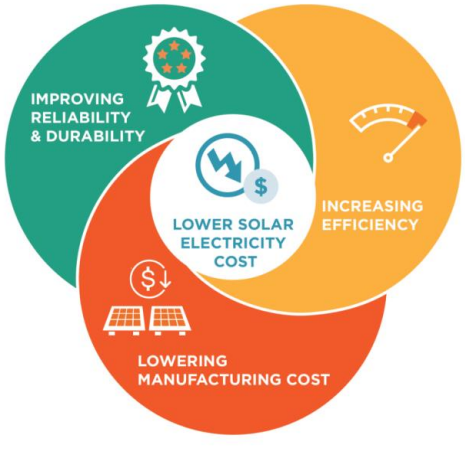

Figure 1. The SunShot Photovoltaics Research and Development program focuses on lowering the levelized cost of solar electricity through three main mechanisms: decreasing manufacturing costs via improved processes and reduced material costs, increasing performance and efficiency, and improving the reliability and durability of modules.

[1] Mills, A.; and Wiser, R. "Changes in the Economic Value of Photovoltaic Generation at High Penetration Levels: A Pilot Case Study of California," *IEEE J. Photovoltaics,* **3** (2013) 1294.
[2] http://energy.gov/eere/sunshot/photovoltaic
[3] Jones-Albertus, B.; Feldman, D.; Fu, R.; Horowitz, K.; and Woodhouse, M. "Technology Advances Needed for Photovoltaics to Achieve Widespread Grid Price Parity," *Progress in Photovoltaics: Research and Applications, in press.* A draft copy can be downloaded here.

C. The Energy Materials Network

The President's Materials Genome Initiative (MGI) was launched in 2011 as part of the Advanced Manufacturing Partnership formed to address challenges in clean energy, health and human welfare, national security, and in developing a next-generation workforce that can successfully meet the challenges associated with all of these. The programs within this framework exist to accelerate the discovery, development, manufacturing, and deployment of advanced materials to a rate twice as fast as what is possible today. Only a small fraction of materials developed at the laboratory scale are commercialized, and those that do reach the market may take ten to twenty years to emerge. These challenges are due to both the magnitude of resources required to qualify a material before it gains industry acceptance and barriers to scale up and validation.

The U.S. national laboratory system offers an opportunity for creating a centralized, streamlined process that leverages modeling methods, high-throughput synthesis and fabrication, and materials characterization and testing capabilities to optimize and certify materials for direct use by industry. The recently announced Energy Materials Network (EMN) is an effort by the Office of Energy Efficiency and Renewable Energy (EERE) at the U.S. Department of Energy to implement relevant MGI methods by collating national lab capabilities into consortia that are easily accessible to industry and academia. EMN consortia that have been initiated already include LightMAT on lightweight materials, ElectroCat on new catalysts in fuel cells, and CaloriCool on refrigerant materials for cooling applications. In order to evaluate and discuss potential opportunities for such a consortium focused on PV module materials (i.e., DuraMat), the SunShot office recently held a workshop, the summary of which was recently published at the SunShot EMN Workshop webpage.

To accomplish its objectives, the DuraMat EMN consortium will function based on the four pillar activities common to all consortia within the Energy Materials Network:

2) *National Laboratory Capability Network:* Connect unique and accessible capabilities from across the DOE National Laboratory System. Capabilities must meet the following requirements:

   - *Uniqueness*. Resources must be unique to the National Laboratory system and not available to industry through conventional means, such as contract research with commercial vendors. Uniqueness includes a combination of unique expertise, personnel, and/or techniques using otherwise conventional equipment.
   - *Accessibility*. Resources must be available to participate in Consortium research.

3) *Coordinator:* Provide a single point-of-contact and Coordinator to connect industry and academic research teams engaged in research and development of PV module and packaging materials to the resource network.

4) *Data Management:* Capture and leverage expertise, data, and tools developed in the network for application across the consortium and, where appropriate, distribute to the scientific community and public. Accelerate learning and development through data analysis and application of advanced data tools.

5) *Technology Transfer and Agreement (TT/A):* Facilitate rapid completion of agreements for project teams, such as intellectual property (IP) and non-disclosure agreements (NDAs) to eliminate tech transfer as a rate-limiting step to progress.

National laboratories are key partners in achieving progress towards the goals of the DOE's Solar Energy Technologies Office and the SunShot Initiative. The national laboratories provided the foundational analysis supporting the formation of the SunShot Initiative and research at the national laboratories has advanced the key technologies and enabled the solar industry to grow over a period of decades. Additionally, national laboratory researchers are often considered internationally recognized experts in their fields of research. The work of the national laboratories continues to be instrumental in accelerating progress towards the SunShot goals. As the economic opportunity for solar becomes both clearer and greater than it has ever been, it is increasingly crucial that the national laboratories continue to focus on addressing the most critical barriers that remain to achieving the SunShot goals. As significant progress has already been made in many important areas, national laboratory research emphasis must necessarily shift to those areas of the greatest remaining opportunity.

D. DuraMat EMN Consortium Development Requirements

The SunShot Initiative is seeking to establish a vertically integrated national laboratory-led consortium that will drive innovation across methods for the prediction and design of materials properties through computation and simulation, data management and informatics, high-throughput synthesis and characterization, and integration into functional PV modules or mini-modules through a network of national lab, university, and PV industry capabilities to rapidly develop and de-risk durable module packaging and coating materials. DOE anticipates that the result of such a consortium will be the integration of new module materials and designs into commercial demonstration and production in order to increase module performance and durability, and decrease the levelized cost of electricity.

Overview of Systems Approach

The paths of scientific discovery and technology development need to inform each other: Advances in science create entirely new technology possibilities; likewise, technology development efforts identify key roadblocks that require improved scientific understanding or wholly new approaches. Connecting fundamental research and technology development through forceful and scientifically astute management of an integrated team is essential to rapid achievements.

The DuraMat EMN consortium is imagined to embrace a centrally-led "integrated" model of research and development towards well-defined technical goals. It is recognized that the traditional "staged" model of separate entities undertaking discovery science, technology development, demonstration, and finally deployment is not likely to provide the scale and pace of effort necessary to produce the materials and system solutions we need to meet the challenging SunShot targets. Rather, there is a need for bold, innovative, and integrated approaches that better couple elements of the national labs' capabilities with those of universities and the private sector in a concerted effort to define and construct an innovation system toward durable PV module development. The consortium should take advantage of science advances and new technologies that are developed nationally and internationally to drive toward the best possible solutions, playing an integral role in the development of future module technologies.

The proposed consortium should take a holistic, systems approach to science and technology and act as an integrator of more basic and applied research and development. To accelerate technological innovation and reduce the barriers to movement of new innovations and technologies to the marketplace, the consortium is expected to include robust and active collaborations with industry partners enabled through the EMN architecture. The consortium will support additional analysis and practical efforts aimed at understanding and achieving technology transfer and eventual large-scale commercialization and deployment of cost-effective technologies.

The scientific and engineering problems to be addressed by the consortium are inherently interdisciplinary, requiring personnel with varied skills and expertise in a wide range of scientific and engineering disciplines. This depth is required for the research team to understand the potential roadblocks and bottlenecks that must be overcome to achieve impactful and commercially viable PV module technologies. The consortium will need to combine exceptional skill and creativity in materials and module performance research and development with expertise in the specific problems to be addressed.

Finally, the proposed work should be justified and motivated by substantial aggregated reductions in the levelized cost of electricity (LCOE) from PV, which would benefit from the development of a coordinated cost model with the performance and durability models described in section E, below. It is difficult to justify significant cost reductions without the understanding of the drivers at the system level, therefore the development of an integrated and comprehensive performance and cost model would help to lower the risk of new technology development by clearly outlining the materials, component, and system design constraints and opportunities.

Management Structure

DOE recognizes that effective management of scientific facilities, programs, and projects is critical to the success of the research and organization. The consortium must have well-designed management plans for program initiation and operations. The management structure must enable empowered scientist-managers to execute quick decisions to shape the course of research. Management of the establishment, research, technology development, resources (both personnel and physical resources), and scientific data are critical to its success, as well as that of the SunShot Initiative. Finally, the consortium will be subject to regular, rigorous reviews of the research and development program, industry engagement, and the management structure, policies, and practices.

In addition, the consortium must present an advisory board that includes seats for each represented national laboratory, as well as seats for industry, academia, and DOE representation. A clear and well-publicized web presence will be needed to describe consortium capabilities, activities, and steward new entities for collaborative research in the module and materials space. A clear communication strategy should ensure the work is coordinated and effective, while enabling system and team-based research activities. And finally a comprehensive plan for responding to the rapidly evolving PV industry while integrating with industry partners will be critical for the continued success of the consortium.

The consortium should propose a plan to comprehensively manage both core research and capability development as well as provide a minimum of 30% of the award to directly fund external projects to compliment and leverage the capabilities of the consortium. Core research and capability developments should be focused on building the infrastructure at the national labs to support the design, development, characterization, and finally demonstration of durable module materials in functional systems so as to quantify both performance gains and cost reductions. Furthermore it is anticipated that the funding of external projects would allow industry and academia to utilize and leverage these unique consortium capabilities as well as offer the potential for external components and capabilities to be integrated within the framework. It is anticipated that external projects would offer academia and industry a mechanism to participate and contribute to consortium activities and help to achieve the overall consortium goals and technical objectives. Additionally a transparent process for the selection of proposed external projects to support and compliment the core research will need to be presented.

The DuraMat consortium may be most effective if it leverages the capabilities of existing consortia and other EMN centers, thus continuing to build on a strong foundation of industrially-relevant collaborative research toward durable, high-performance, and low-cost PV modules and systems. DOE-funded consortia relevant to solar research include but are not limited to: the Bay Area PV Consortium (BAPVC), the Quantum Energy and Sustainable Solar Technologies (QESST) research center, the U.S. PV Manufacturing Consortium (USPVMC), and Solar Rochester. Other relevant consortia might include the NSF-funded Next Generation Photovoltaics Consortium and the Silicon Solar Consortium (SiSoC), as well as consortia related to materials design and development centers such as: the Center for Hierarchical Materials Design (CHiMaD), the Materials Project, and more.

Deliverables

The work of the consortium will span early, applied research to engineering and technology development with an eventual transition to industrial development and deployment. The Consortium will support cross-disciplinary research and development focused on the scientific and market barriers to enable the next generation of PV modules. The Consortium will advance highly promising areas of module materials and technologies from their early stages of research to the point that the risk level will be low enough for further development by industry and successful deployment of new technologies into the marketplace, and the Consortium should assist in the transfer of technology to industry.

As such, the Consortium is expected to have deliverables or benchmarks that help focus the objectives of the research to the proposed short, intermediate, and long term goals they are addressing. Having short term goals, which are of immediate benefit to industry, coupled to long term goals that guide industry to benchmark advancements will provide the accessibility and benefit to industry now and well into the future.

Furthermore, we anticipate the Consortium will provide a technical vision and strategy toward an industrially relevant five-year goal. Relevant examples might include: a path to PV modules with 50 year lifetime that enables an LCOE of $0.03/kWh or a new durable module design that lowers installation costs to reach an LCOE of $0.05/kWh for residential systems. The goal should include specific technical metrics and building of prototypes, which would be invaluable for closing the loops on materials design as well

as component and system performance and reliability so that outcomes are ready for further commercial development and deployment.

Training and Workforce Development

The Consortium should provide opportunities for training students, postdoctoral fellows, and scientists on module material and system development. By bringing together scientists from different areas of research, the Consortium will prepare and train participants to work in diverse research teams to provide and develop system-based materials solutions. The Consortium will establish a culture of interdisciplinary research and development that will enable the participants to continue accelerating development inside the Consortium as well as bringing this culture and knowledge out to the greater U.S. PV community. Additionally, the Consortium should provide the opportunity to introduce students and postdocs to the area of module and module materials research.

Research Collaboration and Coordination

The Consortium may require research and technology capabilities beyond that of the network's skills and resources. If so, the application should demonstrate plans for obtaining and/or developing these additional capabilities, including collaboration with outside scientists and industry members.

The Consortium is expected to include robust interaction with private industry, academia, and universities. The interactions should enable accelerated technological innovation and reduction of the barriers to the movement of new technologies to the marketplace. Examples of this type of activity include (but are not limited to) research partnerships, research personnel exchanges, institution-sponsored post-doctoral or graduate fellowships, participation in the Consortium advisory board, and multi-institutional workshops, meetings, seminars, and conferences. Applicants are encouraged to provide information regarding their plans to create a collaborative research environment among industry, academia, and federal laboratories to enable cognizance of industry readiness, technology transfer, and eventual market penetration.

Additionally, we anticipate that 30% of the available funding would be distributed to support crucial external partnerships to enable, compliment, and utilize capabilities in the Consortium. The aim is to encourage and facilitate external partnerships to expand and leverage existing capabilities outside the national lab system and to ensure a cooperative research and development environment across the labs, universities, and academia. Such funding would be used to fund capabilities required for the overall success of the Consortium to achieve its goals and to engage with those innovators outside of the national labs.

Furthermore, both internal and external resources, partners, and PIs should evolve during the course of the consortium activities. It is expected that new members and partners will be relevant as the Consortium is successful at building unique and enabling capabilities and the management structure will need to be adaptable to the changing needs of the center and especially those of the dynamic solar industry.

In pursuing a focused research and development plan for the Consortium, it is likely (and desirable) that new avenues of basic and applied work will be discovered. To the extent that such new opportunities

diverge from the consortium's primary mission, these should be "spun out" as potential candidates for support from other programs within or outside of the Department of Energy or from industry.

Finally, applicants should describe plans for coordinating their scientific research and technology development as well as data management with other materials development activities supported by the Department of Energy and externally. There are numerous opportunities to engage the MGI, EMN, and materials community outside of the Consortium and to eliminate the many redundancies that could occur by working in isolation. As described above, other organizations should be leveraged so as to enable collaboration across solar research as well as across related fields.

E. Research Focus: PV Module Materials

The Solar Energy Technologies Office's PV research and development program has historically focused primarily on the absorber and contact materials in addition to photovoltaic cell design. The remarkable recent innovations in the PV industry as well as current and historical investments by the Solar Energy Technologies Office have resulted in continued improvements in PV cell performance through improved materials and device architectures. This is often highlighted by the continuous improvements in record cell efficiencies, as published in the NREL record PV cell efficiency chart. While these advancements often translate to improvements in module performance, these and future cell improvements can be further accelerated by focusing on the full PV system and module packaging, including designing for durability.

More broadly, a focus on module materials and design can lead to reductions in the levelized cost of energy (LCOE) of a PV system through a number of different levers, including lower manufacturing costs, increased performance and durability, as well as changes in module design that could reduce balance-of-systems costs such as installation, labor, or operation and maintenance.

When targeting specific module components or manufacturing steps, knowledge of the relative cost of that step is very useful for determining the potential impact of a given research topic. Figure 2 provides approximate manufacturing cost breakdowns associated with the production of multicrystalline silicon and CdTe PV modules including the associated materials, labor, depreciation, maintenance, and electricity costs of each module process. The final assembly of multicrystalline silicon modules accounts for 38% of the total cost (the percentage for monocrystalline silicon is comparable), whereas module conversion and materials are estimated to account for 58% of the total CdTe thin film module cost. Furthermore, the final module fabrication and assembly costs are dominated by the cost of the module materials themselves. Thus, significant reductions in the cost of PV energy may be enabled through the engineering of materials with improved performance and durability at reduced costs.

In addition to targeting reductions in the cost breakdowns above, specific focus on reducing the capital expenditures associated with setting up new production facilities (which also appear as the depreciation costs in Figure 2) has the potential to impact the rate of manufacturing scale-up. Reducing such costs will improve the flexibility and growth potential of existing manufacturers and lower the entry barrier for new competitors. Accordingly, significant improvements and innovations in low-capital module

manufacturing methods leading to increased production yield, throughput, material integration and utilization, or total energy output of PV modules are needed.

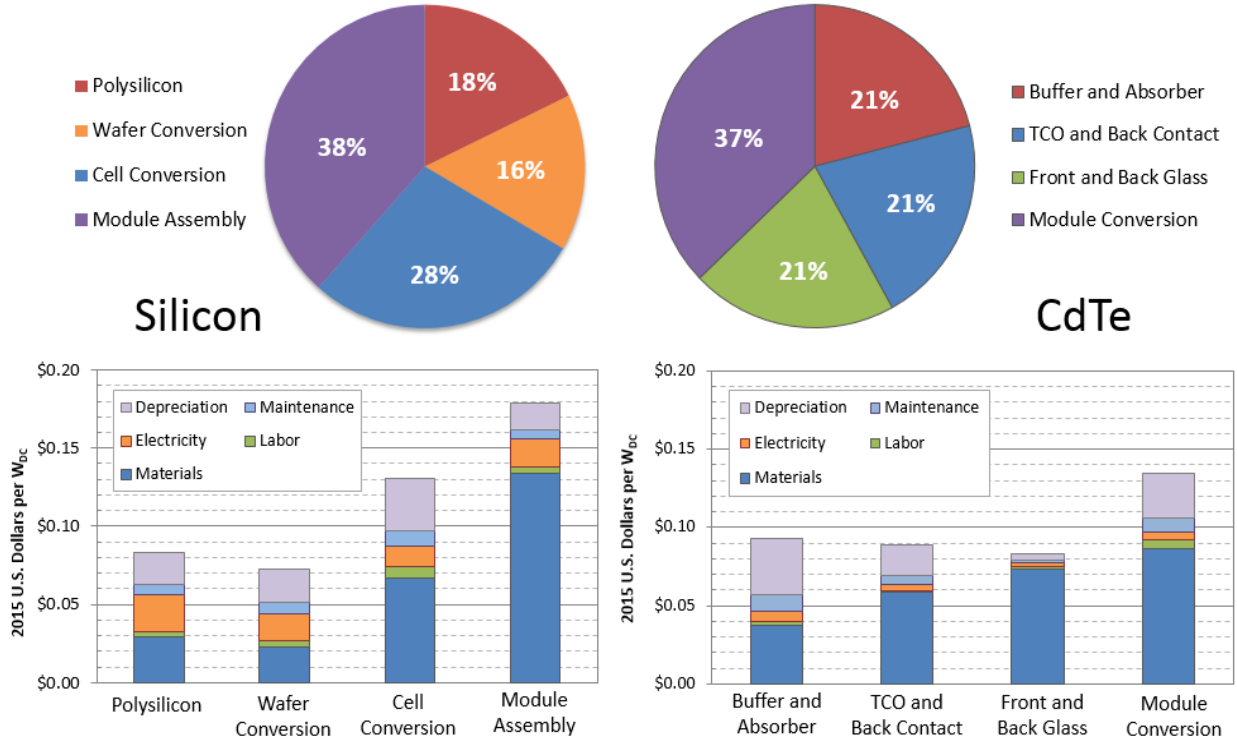

Figure 2. Approximate cost breakdowns of the manufacturing of multicrystalline silicon (left) and CdTe (right) modules. The cost models shown here were assembled using bottom-up calculations, and may differ from those of actual manufacturers.[3] Module materials and assembly account for a substantial portion of the total module costs for both silicon and thin film modules.

Figure 3 shows several curves for module price and efficiency that would each achieve the 2020 SunShot goal of $0.06/kWh LCOE at a given degradation rate and service lifetime for moderate insolation levels for the United States. These curves illustrate various strategies that can be used to attain SunShot's LCOE targets, and highlight the trade-offs between efficiency, module cost, degradation rate, and service lifetime. The curves illustrate the large potential impact that improved module materials might have on the final LCOE of the system through improvements to module degradation rates, service lifetime, cost and performance.

While efficiency and rated power are the typical metrics cited for PV performance, the LCOE of a PV system is determined by how much energy it produces when deployed under operating conditions and the overall service lifetime of the system. Fielded operating conditions are substantially different from the standard tests that define the nameplate efficiency of a given module design, and designing modules to function well in the field can provide an advantage when the LCOE values are calculated for a given system. Significant innovations in materials and module designs toward improving the energy yield of a fielded PV system, and reducing degradation and module failure rates represent valuable steps towards meeting and exceeding the SunShot goals.

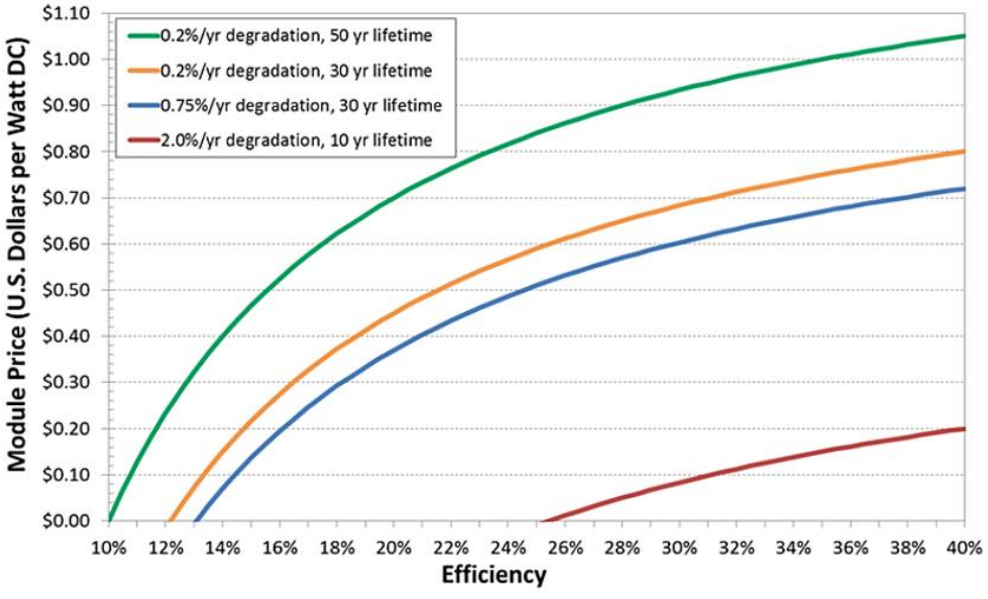

Figure 3. Several trajectories illustrating the various ways that an installed PV system can reach the $0.06/kWh 2020 SunShot LCOE target. All of the points on each of the curves represent sets of values for efficiency, module price, degradation rate, and service lifetime that produce $0.06/kWh at a first year production rate of 1470 kWh/kW (moderate solar resource). Non-module costs were taken to be $150/m^2 for the purpose of these calculations.[3]

Module Materials Innovation

In the literature to date, high-throughput and computational techniques have been primarily employed to examine or control properties such as absorption, defects (bulk and at interfaces), doping, and surface/defect passivation for advanced solar cells. DOE anticipates the proposed consortium will apply and develop such methods toward the development of durable module materials. Furthermore, the modeling and simulation methodologies should be multi-scale efforts in order to inform design and functionality from the atomistic to system-level so as to improve performance and durability predictions against concurrent experimental module and component studies. The identification of productive and impactful problems that can be effectively addressed by the consortium will be imperative for the successful implementation of modeling and simulation in this area.

In order to define the constraints on system component properties and develop integrated models for the performance of components, the deep understanding, thorough characterization, and aggregation of component parameters will be paramount. Enhanced characterization and performance prediction for components will be required so as to define the design constraints and opportunities for new materials for enhancing the overall system performance and durability.

The following is a summary of relevant technical areas that are vital to lowering the LCOE of photovoltaic technologies. They are provided as a non-exhaustive list of opportunities and potential research directions that could be supported through the DuraMat EMN consortium. Impactful topics that are not listed below are also encouraged. While we appreciate that all of these areas will not be addressed in

the one consortium, a framework that outlines a clear, effective, and impactful research plan will be required for the successful application.

Opportunities for module innovation to dramatically reduce LCOE include but are not limited to:

- Module components that increase performance (i.e., energy output over the module lifetime), durability, and/or safety
- Module and system designs that increase performance, durability, and/or safety
- Module components or designs that reduce manufacturing costs
- Module and system designs that decrease cost of installation, operation and maintenance; or that facilitate deployment
- Processes or module designs that improve the ability and/or decrease the cost to recycle PV modules
- Module materials, coatings, and architectures enabling lower temperature operation
- Determination and validation of methods for accelerated durability and stability testing
- Development of test methods, instrumentation and/or protocols that facilitate entry of new PV module technologies into the market through demonstrated performance and durability

Specific module materials and components of interest include, but are not limited to:

- Advanced anti-reflective and anti-soiling coatings
- Flexible packaging, moisture barriers, and low cost alternative substrates
- Advanced encapsulants, edge seals, front sheets, and back sheets
- Novel metal pastes, solders, interconnect materials, string ribbons, conductive adhesives
- Alternatives for aluminum or composite frames, durable junction box systems, and wiring
- Materials with modified thermal or electrical conductivities to reduce the operational temperature or likelihood of potential induced degradation (PID)

Capabilities needed to support development of the material components include but are not limited to:

- Module and component materials durability testing,
- Module prototyping and fabrication,
- Methods for high throughput synthesis and characterization,
- Computational methods for predicting mechanical and chemical durability properties
- Module materials database management and informatics

Section 2. Eligibility and Award Information

Eligibility: All DOE/NNSA Federally Funded Research and Development Centers (FFRDCs), which are Government-Owned, Government-Operated laboratories (GOGOs) or Government- Owned, Contractor-Operated laboratories (GOCOs), are eligible to submit proposals as prime awardees, unless specified otherwise. A principle investigator (PI) is allowed to submit only one proposal, though she/he may be included as a team member on other proposals.

Consortium Teams: DOE/NNSA Federally Funded Research and Development Centers (FFRDCs), which are Government-Owned Government-Operated laboratories (GOGOs) or Government-Owned, Contractor-Operated laboratories (GOCOs), are eligible to partner with other FFRDCs as well as with outside organizations as members of a consortium team.

For-profit entities, educational institutions, and nonprofits that are incorporated in the United States are eligible as members of the Consortium team.

- State, tribal, and local government entities are eligible as members of the Consortium team.

The members of the Consortium team, excluding the prime awardee, may change over the course of the Consortium development and operation in order to respond to changing Consortium or industry priorities.

Total Anticipated Funding: EERE expects to make approximately $30 Million of Federal funding available over 5 years for one award under this call for proposals, subject to the availability of appropriated funds.

Note further that the actual funding amount will be subject to annual appropriations and annual performance evaluations of the Consortium relative to the defined milestones and go/no-go criteria.

Cost Share: A cost share of 10% is required, as partnerships with commercial entities are encouraged in order to foster transfer of developed technologies to commercial implementation and to increase the impact of the funded activities.

The Prime Recipient is solely responsible for managing cost share contributions by the Consortium Team. This responsibility includes enforcing any cost share obligation assumed by Consortium Team members in sub-awards or related agreements. Each Consortium Team is free to determine how best to allocate the cost share requirement among the team members. The amount contributed by individual Consortium Team members may vary, as long as the cost share requirement for the project as a whole is met.

Consortium Teams may provide cost share in the form of cash or in-kind contributions. 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.

Consortium 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.

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.

Period of Performance: Proposals can seek funding for a maximum period of five years, with a start date no earlier than September 1, 2016 and an end date no later than September 30, 2021.

Section 3. Application and Submission Information

Proposal Application Information

SunShot is seeking proposals for a potential EMN consortium on durable module materials. As described below the Proposals will outline the proposed management structure and proposed technical thrust. It is anticipated that only one Proposal will be recommended to develop a Detailed Consortium Description and it is expected that the team structure of the consortia will evolve and expand at this stage.

E. **Application Process**

1. Proposals

   To be eligible to submit a Detailed Consortium Description, Applicants must submit a Proposal by the due date specified on the cover page of this Announcement. The Proposal content requirements are **provided in Section B**. SunShot will perform a preliminary review of Proposals to determine whether they are compliant with the Proposal requirements. SunShot reserves the right to not review and/or not consider noncompliant Proposals. If a lab or proposal is not selected to develop a Detailed Consortium Description, this by no means precludes the lead or partners from being active participants or partners in the awarded consortium.

2. Detailed Consortium Description

   It is anticipated that SunShot will select one applicant to enter award negotiations. As part of the negotiation process, the applicant will develop a Detailed Consortium Description in partnership with the DOE. The Detailed Consortium Description will provide a detailed description of the motivation and impact of the proposed consortium on SunShot targets and will outline comprehensive descriptions of both the management and technical work plans required to achieve the consortium's objectives. The Detailed Consortium Description content guidelines are **provided in Section C** below.

F. **Content and Form of Proposals**

Proposals must conform to the following requirements for format and content:

1. Each Proposal must be submitted as a single PDF document no longer than 10 pages in total (per the content instructions below), exclusive of a 1-page Cover Page and an appendix of 2-page resumes. If proposals are over the page length, EERE staff may redact extra pages. If proposals are non-compliant because the proposal did not meet other requirements, staff will deem such proposals ineligible for review, and therefore such proposals will not be eligible to submit a Detailed Consortium Description.

2. All pages must be formatted to fit on 8-1/2 by 11 inch paper with margins not less than one inch on every side. Use single or greater line spacing, a black font color, and a font size of 11 points or larger (a smaller font may be permitted in figures and tables as long as it is readable). Pages should be numbered at the bottom of the page and include the proposal identifier (PI name and institution) in the heading of each page.

3. Proposals must include all the required components and be arranged in the required order as described below.

4. All Proposal documents must include a reference code in the top right corner of the header in the following format: [Institution]. [PI Last Name]. For example, "LANL.Smith" would be representative for a Proposal from PI Smith at Los Alamos National Lab.

Each SunShot EMN Proposal must describe the ultimate technical goal of the consortium and identify primary research thrusts necessary to accomplish this. The Proposal should articulate the problem to be addressed, the research approach, and how the proposed goal will be accomplished. The following components are required in the Proposal, and should be **assembled in the order given below and submitted as a single PDF file**, to be compliant for a merit review.

1. **Cover Page (1 Page)**: Include the following on a single page.
    a. Proposal reference code (as per Requirements 4 above)
    b. Lead organization
    c. Principal investigator name and contact information
    d. Proposed core board members
2. **Technology or Concept Description (6 Pages Maximum):** Applicants are required to succinctly describe the following, including figures, charts, graphs, or other data to support the description:
    a. The proposed five year technical achievement(s) for the consortium
        i. This should include an overarching, clearly articulated goal for the consortium; and
        ii. Yearly high-level technical and management goals should be described and should include metrics related to durability.
    b. The proposed core research and development thrusts
        i. Describe the research thrusts and core capabilities required to achieve the technical goals of the proposed consortium
        ii. Describe the complimentary or external capabilities or activities that will be required or developed;
        iii. Describe how the proposed solution will meet or exceed the SunShot targets in a relevant timeframe;
3. **Management Plan and Team (4 Pages Maximum)**
    a. Describe how the proposed consortium will enable an environment that facilitates the rapid transfer from R&D to proven concept as described in the EMN overview
    b. Describe the management structure of the consortium
        i. Describe process for working between the prime awardee, other FFRDCs, and other external institutions, including how decisions about research directions will be made;
        ii. How the consortium will engage industry partners in impactful and cooperative research.

c. The overall team

i. The core institutions, including any co-PIs, along with a description of their qualifications to perform the proposed work and their roles and responsibilities on supporting core research and capabilities;

ii. Preliminary core management board members;

iii. Proposed external institutions.

4. Resumes for the PI, any co-PIs, and core board members

G. **Detailed Consortium Description Requirements**

To be eligible to submit a Detailed Consortium Description, Applicants must have submitted a Proposal and have received notification from DOE to begin the award negotiation process, including development of a Detailed Consortium Description.

The following components are anticipated to be required in the Detailed Consortium Description, and must be assembled in the order given below and submitted as a single PDF file.

I. Cover Page (**not to exceed one page**)

II. Executive Summary (**not to exceed one page**)

III. Technical Narrative (**not to exceed 20 pages**):

The Technical Narrative should provide a clear statement of the work to be undertaken and must include objectives for the period of the proposed work and expected significance, relation to longer-term goals of the Consortium, and relation to the present state of knowledge in the field, to work in progress by the partner institutions funded by DOE and other agencies/entities, and to work in progress by other leaders in the field of research including industry. The Technical Narrative should outline the general plan of work, including the broad design of activities to be undertaken, and, as appropriate, provide a clear description of experimental methods and procedures, theoretical and analytical approaches, and computational methods.

a. Prior recent accomplishments and their intellectual outcomes (publications, patents, etc.), for the core institutions and all the key personnel (co-investigators) in the relevant field of research (**not to exceed one page**).

b. Technical Justification (**not to exceed 9 pages**)

i. Technical approach and methodology as well as a concise description of the goals and deliverables of the Consortium

ii. Description of existing core consortium capabilities and those to be developed and expanded externally

iii. Comparison of proposed work/methodology to related past and present work in the relevant field of research

iv. Impact on SunShot goals if the research is successful and, separately, if the research is not successful (i.e. what will be learned to further the SunShot Initiative even if the originally proposed technical outcomes are not achieved).

v. Team expertise and justification of partners (i.e. why lab based R&D on this particular research topic is important).

vi. Degree to which existing facilities and infrastructure is leveraged for the proposed research.

c. Statement of Project Objectives (SOPO) (**not to exceed 10 pages**).

IV. Commercialization Plan (**not to exceed 5 pages**):

The Commercialization Plan should provide a clear strategy to take the technology or concept to be developed from the laboratory to commercial relevance. The plan should contain a clear strategy to engage with the relevant industry during the course of the work as well as an appropriate mechanism for transferring the work or technology performed to the commercial arena (i.e. licensing, spin out/start-up, etc.). For analysis projects, this can amount to the dissemination plan.

V. References Cited (**no page limit**)

VI. Project Timeline, Milestones and Deliverables (**not to exceed 2 pages**)

VII. IP management plan **(not to exceed 3 pages)**

VIII. CV for the Lead PI and Key Personnel (**not to exceed 2 pages per person**) a. Academic/professional qualifications b. Bibliography of relevant publications within the last three years

IX. Detailed Budget Breakdown (DOE EERE 335 form, found in Exchange, complete for each project participant)

X. Current and Pending Support Summary for the PI and each key personnel (**use the template provided in Exchange, no page limit**)

XI. List of Facilities, Equipment, and Other Resources Available for the Project (**not to exceed 3 pages**)

XII. Collaborator's letter of support or commitment to participate in the project (**if applicable, no page limit**)

H. Proposal Submission Information

Lead Principal Investigators are responsible for meeting the proposal submission deadline. The Proposal must be submitted as a single PDF file that must be emailed to SunShot.EMN@ee.doe.gov by the date indicated on the first page of this document. The file should have the same name as the reference code for the project [Laboratory Acronym]_[PI Last Name]

The SunShot Initiative will not accept or respond to Proposals received by other means (e.g. standard mail, telephone calls, faxes).

Proposal Evaluation and Award Selection

I. Compliance Review

Proposals must meet all Compliance Criteria listed below or they may be considered noncompliant. SunShot may not review or consider noncompliant submissions, including Proposals that were: submitted through means other than via email to SunShot.EMN@ee.doe.gov; submitted after the applicable deadline; and/or submitted incomplete.

1. Compliance Criteria

A. *Proposals*

Proposals are deemed compliant if:

- The Proposal complies with the content and form requirements in Section 3.B of this document; and
- The Applicant emailed all required documents to SunShot.EMN@ee.doe.gov before the deadline stated on the cover page of this document. DOE will send a confirmation of the receipt of the email.

J. Proposal Merit Review Criteria

SunShot will consider a combination of quantitative and qualitative criteria in selecting an applicant to develop a Detailed Consortium Description. Proposals are evaluated based on the following criteria:

Criterion 1: Impact of the Proposal Relative to State of the Art, Technical Merit, and Relevance to SunShot (50%)

This criterion involves consideration of the following factors:

- The extent to which the module materials technology and/or approach is impactful, innovative, and offers significant advancement in durability and performance beyond the current state of the art in PV modules and systems;
- If successful, the extent to which the proposed technology and/or approach would be adopted by markets and improve the economic value of solar energy in a relevant timeframe (2020 for meeting SunShot targets, 2030 for those seeking to reduce LCOE *significantly* below SunShot 2020 targets);
- The likelihood that the proposed R&D will have an impact on domestic PV module manufacturing and materials supply chain;
- The description of focused areas of research and development spanning rapid materials development through demonstration and testing of new module prototypes;
- The description of clearly defined technical and data management capabilities that will be developed and utilized to accomplish the overall objectives of the Consortium

Criterion 2: Management Plan, Teaming, and Capabilities (50%)

This criterion involves consideration of the following factors:

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work, across the R&D spectrum from early-stage research to engineering development and across multiple disciplines, with a good chance of success;
- The effectiveness and integration of external projects and participants in addition to the management and selection of complimentary external work comprising 30% of the total award funds;
- The ability of the management plan and senior leadership to encourage synergy and cohesion among investigators, particularly from different research fields, and to encourage a high-risk, high-reward research, development, and deployment program that is able to pivot as needed to maximize impact;
- The ability of the plan to promote the adoption, manufacture, and commercialization of innovative technologies resulting from the Consortium's activities by industry in the U.S, including institutional experience/expertise in these activities;
- The adequacy of the description of the external advisory committee's role, appropriateness of the proposed committee staff (industry, academia, and federal laboratory representation), and adequacy of the plan for external oversight and guidance to provide high-quality scientific and technical direction to the program of research;
- The ability of the proposed consortium to provide opportunities to inspire, train, and support leading scientists and engineers of the future and/or provide outreach to the technical community.

K. Evaluation and Selection Process

1. Overview

The evaluation process consists of an initial eligibility review and a technical review according to the stated evaluation criteria. Technical reviews will be conducted by reviewers that are experts in the subject matter of this Call for Proposals. Ultimately, SunShot will consider the recommendations of the reviewers, along with other factors, in determining which applications to select. By submitting a proposal to SunShot, Applicants consent to SunShot's use of Federal employees, contractors, and experts from educational institutions, nonprofits, industry, and governmental and intergovernmental entities as reviewers. SunShot selects reviewers based on their knowledge and understanding of the relevant field and application, their experience and skills, and their ability to provide constructive feedback on proposals. SunShot requires all reviewers to complete a Conflict-of-Interest Certification and Nondisclosure Agreement through which they disclose their knowledge of any actual or apparent conflicts and agree to safeguard confidential information contained in the Proposals. In addition, SunShot trains its reviewers in proper evaluation techniques and procedures.

2. Selection from Proposal review

SunShot will complete a review of the Proposals and then select one applicant to develop a Detailed Consortium Description as part of the award negotiation process. **It is anticipated that only one applicant will be selected to develop a Detailed Consortium Description.** SunShot may request specific additional information from selected Applicants in developing the Detailed Consortium Description, as well as conduct pre-selection meetings, webinars, videoconferences, conference calls, or site visits before making a selection determination. SunShot will not reimburse Applicants for travel and other expenses relating to pre-selection meetings and site visits, nor will these costs be eligible for reimbursement as pre-award costs.

SunShot may select a team for funding without pre-selection meetings and site visits. **Participation in a pre-selection meeting or site visit with SunShot does not signify that Applicants have been selected for an award.**

4. Pre-Selection Interviews

As part of the Proposal selection process, SunShot may invite one or more Applicants to participate in Pre-Selection Interviews. The invited Applicant(s) will meet with SunShot representatives to provide clarification on the contents of their Proposal and to provide SunShot an opportunity to ask questions regarding the proposed project. The information provided by Applicants to SunShot through Pre-Selection Interviews contributes to SunShot's selection decision. SunShot will arrange to meet with the invited Applicants in person at SunShot's offices or a mutually agreed upon location. SunShot may also arrange site visits at certain Applicants' facilities. In the alternative, SunShot may invite certain Applicants to participate in a one-on-one conference with SunShot via webinar, videoconference, or conference call. If Applicant(s) receive a notice of selection for a Pre-Selection Interview of their Proposal, the format and duration of the Pre-Selection Interview will be communicated to those Applicants at that time. SunShot 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. SunShot may obtain additional information through Pre-Selection Interviews that will be used to make a final selection determination. SunShot may select applications for funding and make awards without Pre-Selection Interviews. Participation in Pre- Selection Interviews with SunShot does not signify that Applicants have been selected for an Award.

L. Selection Notifications

SunShot anticipates notifying Applicants whether they are selected to prepare a Detailed Consortium Description (as part of award negotiations) and subsequently making an award by the dates specified on the cover page of this document.

1. Rejected Submissions

Ineligible, non-responsive, and non-compliant Proposals may be rejected by SunShot and are not reviewed or considered. SunShot sends a notification letter by email to the technical point of contact designated by the Applicant in their submitted proposal. The notification letter states the basis upon which the Proposal was rejected.

2. **Proposal Notification**

SunShot notifies Applicants of its determination to enter award negotiations and develop a Detailed Consortium Description following review of the Applicants Proposal. SunShot sends a notification letter by email to the technical point of contact designated by the Applicant.

A notification letter to begin award negotiations and develop a Detailed Consortium Description does not authorize the Applicant to commence performance of the project.

3. **Detailed Consortium Description Notification**

SunShot notifies Applicants of its determination via a notification letter by email to the technical point of contact designated in the proposal. The notification letter may inform the Applicant that its Proposal was selected for award negotiations and development of a Detailed Consortium Description, or that it was not selected for negotiations. Alternatively, SunShot may notify one or more Applicants that the final selection for a negotiated Detailed Consortium Description will be made at a later date, subject to the availability of funds or other factors.

4. **Successful Applicants**

A notification letter selecting a Proposal for award negotiations and development of a Detailed Consortium Description **does not** authorize the Applicant to commence performance of the project. If a Proposal 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 SunShot executes the funding agreement.

The Applicant must be responsive during award negotiation. SunShot will send a notification letter by email to the technical point of contact to officially approve the negotiated Detailed Consortium Description, including the Statement of Project Objectives (SOPO), Project Management Plan (PMP), and budget.

5. **Unsuccessful Applicants**

SunShot shall promptly notify in writing each Applicant who's Proposal has not been selected for development of a Detailed Consortium Description and negotiations. If the Proposal was not selected, the written notice shall explain why the application was not selected.

M. **Other Selection Factors**

Program Policy Factors

In addition to the above criteria, the Selection Official may consider the following program policy factors in determining which Proposal is selected for negotiations and to develop a Detailed Consortium Description.

- The degree to which the proposed Consortium addresses the goals indicated in this Call for Proposals.
- The degree to which the proposed Consortium contributes to diversity and balance within the SETO portfolio so that SETO has the best possible portfolio of projects that will maximize the probability of reaching the SunShot goals.

- The ability to encourage and stimulate domestic PV and supply chain manufacturing.
- The degree of leveraging DOE and Federal resources.
- Alignment of the proposed Consortium activities without duplication, overlap, and fragmentation with the other R&D programs in DOE and the U.S. Government.
- Strategy for developing synergies between this Consortium and new or existing institutional infrastructure.
- Diversity of activities across the materials lifecycle that will lead to new technologies within the Consortium's purview.

N. **Considerations for the development of the Detailed Consortium Description**

Detailed Consortium Description are evaluated based on the following criteria:

Criterion 1: Impact of the Proposal Relative to State of the Art, Technical Merit, and Relevance to SunShot

This criterion involves consideration of the following factors:

- The extent to which the technology and/or approach is unique, innovative, and advances significantly beyond the current state of the art.
- If success is achieved, the extent to which the proposed technology and/or approach would be adopted by markets and improve the economic value of solar energy in a relevant timeframe.
- The scientific and technical quality of the proposed R&D, including the degree to which it is comprehensive, well-balanced, and at the forefront of current worldwide research efforts;
- The degree to which the proposed R&D will address research needs and gaps in the area of focus;
- The opportunity for technical innovation in the areas of focus of the proposed R&D based on a critical evaluation of existing knowledge and IP constraints;
- The likelihood that the proposed R&D will have an impact on domestic PV module manufacturing and materials supply chain;
- The ability of the Consortium to overcome scientific, engineering, and technical obstacles/risk to achieve the research objectives;
- The ability to integrate and balance the technical strengths of each participant to produce a cohesive R&D program;
- The ability of the Consortium to adapt its R&D focus to materials that can enable dramatic improvements in performance, durability, and a reduction in the levelized cost of electricity;
- The likelihood that the proposed short-, medium- and long-term goals will accomplish the stated goals of this Call for Proposals.

- The degree to which the proposed milestones represent a systematic approach to achieving the ultimate goals;
- The likelihood of the Consortium accelerating technological innovation and reducing barriers to movement of new technologies into the marketplace;
- The quality of the plan to transition Consortium R&D into technology Development & Deployment

Criterion 2: Consortium Management Plan

This criterion involves consideration of the following factors:

- The ability of the management plan to encourage synergy and cohesion among investigators, particularly those from different research fields, and to encourage a high-risk, high-reward R&D (and D&D when applicable) program;
- The degree to which the management plan articulates an organizational structure with clearly delineated roles and responsibilities of senior/key personnel;
- The ability of the management structure to balance the interests of each team member with the interests of the Consortium team as a whole;
- The quality of the planned approach to information sharing and data management for achieving the goals of the proposed Consortium;
- The ability of the Consortium to disseminate non-proprietary scientific data to a wide technical audience;
- The ability of the plan to promote the adoption, manufacture, and commercialization of innovative technologies resulting from the Consortium's activities by industry in the U.S, including institutional experience/expertise in these activities;
- The likelihood of the management plan to successfully manage work across the complete R&D spectrum from basic research to engineering development and across multiple disciplines;
- The degree to which the management plan incorporates meaningful collaborations;
- The adequacy of the description of the external advisory committee's role, appropriateness of the proposed committee staff (industry, academia, and federal laboratory representation), and adequacy of the plan for external oversight and guidance will provide high-quality scientific and technical direction to the program of research;
- The ability of the applicant's program to provide opportunities to inspire, train, and support leading scientists and engineers of the future and/or provide outreach to the technical community;
- The quality of the plan to coordinate with and not duplicate other research activities supported by DOE and other federal agencies;

- The appropriateness and adequacy of the approach to measuring performance against the stated deliverables and milestones;
- The adequacy of the performance monitoring systems to ensure the overall project is operated within proposed scope, cost and schedule.

Criterion 3: Team and Capabilities

This criterion involves consideration of the following factors:

- The demonstrated record of R&D (and D&D as applicable) productivity, and technical experience, of the senior/key personnel;
- The demonstrated record of success of the lead institution and senior leadership in project, program, and personnel management for multidisciplinary teams, in efforts of comparable scope and magnitude;
- The adequacy of the role and intellectual contribution of the Consortium Director and senior/key personnel;
- The adequacy of the plans for external collaborations and partnerships, including the utilization of DOE user facilities;
- The adequacy and appropriateness of the plan for recruiting additional scientific, engineering and technical personnel both internally and externally through academic and industry members and partnerships;
- The degree of access to, and quality of, existing research facilities and instrumentation at the lead institution and its partners; and
- The lead and partner institution's demonstrated compliance with ES&H requirements.

Criterion 4: Intellectual Property (IP) Management Plan

This criterion involves consideration of the following factors:

- The likelihood that the intellectual property plan will result in domestic commercialization, manufacture, and adoption of technologies relevant to the use of critical materials in energy technology;
- The ability of the intellectual property plan to rapidly establish agreements for project teams, such as intellectual property (IP) and non-disclosure agreements (NDAs), that eliminate tech transfer as a rate-limiting step to progress, encourage external participation in the Consortium and support collaboration between Consortium members and U.S. industry
- The adequacy of the intellectual property plan to address intellectual property matters between Consortium members, including the resolution of disputes and exchange of confidential information;
- The quality of the plan to address background IP (*e.g.*, any requirements for identifying it or making it available);

- The ability the plan to address inventions made under a Consortium project (*e.g.*, any requirements for disclosing to the Consortium or its members, filing patent applications, paying for patent prosecution, and cross-licensing or other licensing arrangements between the members);
- The quality of the plan to address data generated, including software, under a Consortium project (*e.g.*, any publication process or other dissemination strategies, copyrighting strategy or arrangement between Hub members);
- The ability of the plan to address intellectual property issues that may arise due to changes in membership of the Consortium; and

Criterion 5: Reasonableness and appropriateness of the proposed budget

This criterion involves consideration of the following factors:

- The reasonableness of the requested operating Consortium for the planned program;
- The ability of the requested budget to establish the Consortium in a cost-effective manner, including the costs of acquiring and preparing the space to house the Consortium and any required equipment and instrumentation, and in consideration of annual differences in budget that may be required to ramp up and transition the Consortium; and
- The adequacy of the resource distribution to support the designated scope and ensure sufficient engagement of key personnel.

O. **Frequently Asked Questions and Procedure for Future Questions**

In order to ensure a fair and impartial process, all questions regarding the DuraMat call for proposals must be sent via email to SunShot.EMN@ee.doe.gov. Questions sent through any other form of communication (written letter, phone calls, fax, etc.) will not receive a response. No individual member of SunShot should be contacted in order to obtain a response to a question about this call for proposals and SunShot staff has been instructed not to provide response to questions received through any other means other than email to the email addresses below.

Questions should be sent via email to: SunShot.EMN@ee.doe.gov. All questions will be posted and answered publicly at: http://energy.gov/eere/sunshot/downloads/call-proposals-duramat-consortium