HPC4EnergyInnovation Program:
Collaborations for U.S. Manufacturers

The High Performance Computing for Energy Innovation (HPC4EI) Program seeks qualified industry partners to participate in short-term, collaborative projects with the Department of Energy's (DOE) National Laboratories. HPC4EI is the umbrella initiative for the HPC4Manufacturing (HPC4Mfg), HPC4Materials (HPC4Mtls), and HPC4Mobility programs. This solicitation is sponsored by the HPC4Manufacturing and HPC4Materials Programs. Through support from the Office of Energy Efficiency and Renewable Energy's (EERE) Advanced Manufacturing Office (AMO) and support from the Office of Fossil Energy the selected industry partners will be granted access to high performance computing (HPC) facilities and world-class scientists at DOE's National Laboratories.

The Department of Energy's HPC4Mfg Program is interested in establishing collaborations that address key energy-related challenges for domestic manufacturers. By applying advanced modeling, simulation, and data analysis, these projects will improve energy efficiency, increase productivity, reduce cycle time, enable next-generation technologies, investigate intensified processes, lower energy cost, and accelerate innovation. The HPC4Mtls Program is interested in collaborations that address key challenges in developing, modifying, and/or qualifying new or modified materials that perform well in severe or complex environments through the application of HPC, modeling, simulation, and data analysis.

Eligibility for the HPC4Mfg Program is limited to entities that manufacture in the United States for commercial applications and the organizations that support them. Eligibility for the HPC4Mtls Program is limited to entities that develop materials in the United States for relevant commercial applications and the organizations that support them. Applicants are highly encouraged to partner with universities and non-profit organizations located within federally-designated Opportunity Zones and/or Historically Black Colleges and Universities (HBCU). Additionally, the proposed project must be executed in the United States. Selected demonstration projects will be awarded up to $300,000 to support compute cycles and work performed by the National Laboratory partners. The industry partner must provide a participant contribution of at least 20% of the total project funding for the project. The industry contribution must come from non-federal funding sources.

In addition, follow-on projects to previously awarded, successful demonstration projects in these areas will be considered. These projects should focus on the further implementation of the demonstrated HPC application in the industrial setting - taking it closer to operational use and broad national impact. Selected follow-on projects will be awarded up to $300,000 to support computing cycles and work performed by the National Laboratory, university and non-profit partners. The industry partner must provide a participant contribution of at least 33.3% of the total project funding; of this, at least half must be in cash to support the National Laboratory work.

Background

DOE maintains world-class HPC expertise and facilities, currently hosting four of the top 15 most powerful computers in the world as ranked by TOP500 in June 2020. From detailed subatomic-level simulations to massive cosmological studies, researchers use HPC to probe science and

LLNL-MI-815626

technology questions inaccessible by experimental methods. Scientific insights gained from these computational studies have drastically impacted research and technology across industrial sectors and scientific fields. Examples include additive manufacturing, aerospace, oil recovery, drug development, climate science, genomics, and exploration of fundamental particles that make up our universe. From industry to academia, the scientific need for advanced computing continues to drive innovation and development for future high performance computers and their capabilities.

There is high potential for U.S. industry to utilize the power of HPC. The HPC4EI Program is intended to provide HPC expertise and resources to industry to lower the risk of HPC adoption and broaden its use to support transformational and early-stage technology development. The HPC4EI Program hopes to provide this HPC expertise by supporting targeted collaborations between industry and DOE's National Laboratories.

Successful applicants will work collaboratively with staff from one or more of the DOE National Laboratories to conduct project activities across the various HPC areas of expertise, including development and optimization of modeling and simulation codes, porting and scaling of applications, application of data analytics, as well as applied research and development of tools or methods.

To make the broadest impact across the industry, the project teams are expected to present their results at workshops associated with the program and at regional and national conferences. Publications are also encouraged.

Area 1: HPC4Mfg

DOE's Advanced Manufacturing Office within the Office of Energy Efficiency and Renewable Energy is the primary sponsor of the HPC4Mfg Program. The Office of Fossil Energy and EERE's other Technology Offices may also sponsor select projects in this portfolio. AMO partners with private and public stakeholders to support the research, development, and deployment of innovative technologies that can improve U.S. competitiveness, save energy, and ensure global leadership in advanced manufacturing. AMO supports cost-shared research, development, and demonstration activities in support of crosscutting next-generation technologies and processes that hold high potential to significantly improve energy efficiency and reduce energy-related emissions, industrial waste, and the life-cycle energy consumption of manufactured products.

Improved energy efficiency across the manufacturing industry is one of the primary goals of the HPC4Mfg Program. The program solicits proposals that require HPC modeling and simulation to overcome impactful manufacturing process challenges resulting in reduced energy consumption and/or increased productivity. Proposals should provide a realistic assessment of the energy impact, the improvement in U.S. manufacturing competitiveness, and the increase in U.S. manufacturing jobs that a successful outcome of the project could have across the industrial sector.

Of particular interest to AMO are:

- Improvements in manufacturing processes which result in significant national energy savings. Examples include

a. Process improvements in high-energy consuming industries such as paper and pulp, primary metal manufacturing, water and wastewater, glass and chemical industries;
b. Improvements in material performance in harsh service environments such as very high temperature or highly corrosive processes;
c. Integration of advanced object recognition and other machine learning algorithms (e.g. sortation, defect detection) into high throughput industrial processes;
d. Improvements in modeling prediction and closed-loop control for smart manufacturing systems (e.g. advanced sensors and process controls); and
e. Improvements in separation and processing for critical materials (e.g. rare earth elements).

- Improvements in the lifecycle energy consumption of products of interest to AMO. Examples include

  a. Improvement in jet engine efficiency could save significant energy over the lifecycle of the engine;
  b. Improved materials and shape optimization for light-weighting in transport technologies;
  c. Semiconductor electrical efficiency; and
  d. Increased recycling and reuse of end-of-life and waste associated with industrial-scale materials production and processing.

- Efficiency improvements in energy conversion and storage technologies. Examples include

  a. Improvements in combined heat and power units which save significant energy;
  b. Novel energy storage and energy conversion techniques; and
  c. Improvements in waste heat recovery.

Area 2: HPC4Mtls

DOE's Office of Fossil Energy is the primary sponsor for this HPC4Mtls Program. FE plays a key role in helping the United States meet its continually growing need for secure, reasonably priced, and environmentally sound energy from our abundant fossil energy resources. The Office of Fossil Energy Research and Development (FER&D) Program advances transformative science and innovative technologies that enable the reliable, efficient, affordable, and environmentally sound use of fossil fuels.

Decarbonization of the power and industrial sectors is of renewed interest, and hydrogen is expected to play a role in decarbonizing these sectors. As fossil energy is the source of >95% of hydrogen worldwide and in the U.S., FE technologies in hydrogen production and utilization will play a major role.

FE partners with industry, academia, national labs, and research facilities in transformative science and innovative technologies that enable the reliable, efficient, affordable, and environmentally sound use of fossil fuels. FE supports cost-shared research, development, and demonstration activities in support of crosscutting next-generation technologies and processes that further the development of advanced fossil technologies. Proposals should provide a realistic assessment of the benefits to the domestic materials supply chain and/or fossil energy application

(e.g. power plant).

Of particular interest to FE in this solicitation are:

- Improving the understanding of the materials impacts including corrosion and erosion effects of gasification of blends of coal, biomass and waste plastics on materials in high temperature regions of a gasifier, including sensitivity analysis of blend percentages and types of coal, biomass and waste plastics in the process feed
- Improving the understanding of the material impacts including hydrogen embrittlement effects of blends of natural gas and hydrogen on materials in pipelines, welded joints or compressors, including sensitivity analysis of blend percentages
- Use of computational databases and machine learning for thermal barrier coating (TBC) development for hot gas path components of combustion turbines firing natural gas-hydrogen blends or 100% hydrogen
- Improving the understanding of detailed processes in critical focus areas such as oxidation, corrosion, and electrochemical interactions in Creep Strength Enhanced Ferritic (CSEF) alloys, austenitic alloys and high nickel superalloys
- Use of computational databases and machine learning for catalyst development to synthesize, test, characterize, and scale materials which convert carbon oxides into value-added products with increased energy efficiency, higher selectivity, and lower environmental impacts based on a lifecycle analysis relative to conventional products
- Developing machine learning capabilities to predict composition, thermal performance, and mechanical properties of new materials for energy storage
- Developing the capability to predict the mechanical behavior and properties of additively manufactured components for use in advanced power cycles such as supercritical carbon dioxide cycles

1. Materials Supply Chain for Fossil Energy Applications:

- Reducing the cost of ingot production for nickel superalloys suitable for fossil energy applications
- Improving high-temperature mechanical performance for lower-cost alloys as compared with more costly, high nickel/cobalt alloys
- Overcoming barriers to scale up new material production from grams to kilograms, and from kilograms to tonnes
- Overcoming barriers to the manufacture of components with High Entropy Alloys (HEA)
- Improving speed and quality of welding and other advanced joining methods for nickel superalloys
- Advanced manufacturing of components for fossil energy applications, particularly for repair of existing plant components and modular fabrication of new plants
- Machine learning within the supply chain to lower costs and improve productivity

2. Existing and New Power Plant Applications:

- Predicting material behavior in specific severe environments, such as high-

temperature, cyclic, or oxidative/corrosive, erosive environments, found in coal gasification systems
- Development of coatings, claddings, and other surface treatments to mitigate oxidation, corrosion, and erosion of high-temperature components
- AI applications for monitoring and diagnostics of power plants focused on materials failures such as calculating remaining useful life of components or pattern recognition
- Analysis of thermal fatigue-driven failures, particularly in coal-fired boilers and natural gas combined cycle heat recovery steam generators, to develop and/or validate remaining life predictive tools.
- Improving reliability of dissimilar welds between CSEF alloys, austenitic alloys and/or high nickel superalloys
- Overcoming barriers to the manufacture of components for fuel cells
- Developing machine learning capabilities to identify promising new materials for non-battery energy storage technologies that can integrate with fossil energy power generating units

Eligibility

Eligibility is limited to U.S. manufacturers, defined as entities that are incorporated (or otherwise formed) under the laws of a particular state or territory of the United States, and that manufacture products in the United States or that manufacture, distribute, or otherwise deploy software and hardware systems as described above or that develop and/or manufacture new or modified materials in the United States. Project work must be executed in the United States.

U.S. universities, institutes, and other non-profit organizations are also eligible to participate as collaborators. Applicants are highly encouraged to partner with universities and non-profit organizations located within federally-designated Opportunity Zones and/or Historically Black Colleges and Universities (HBCU). Funding for university and/or non-profit participants may be provided by the National Laboratory or the industrial partner. Funding provided to a university and/or non-profit by the industrial partner can be considered a component of the industrial partner's in-kind funding contribution.

An entity may only submit one Concept Paper and one Full Application for each Sub-Topic area of this solicitation. That is, one per HPC4Mfg (Area 1) and one per HPC4Mts (Area 2). If an entity submits more than one Concept Paper and one Full Application to the same Sub-Topic area, a determination from the applicant's authorizing representative as to which application should be reviewed will be requested. Any other submissions received listing the same entity as the applicant for the same Sub-Topic area will not be eligible for further consideration. This limitation does not prohibit an applicant from collaborating on other applications (e.g., as a potential subrecipient or partner) so long as the entity is only listed as the applicant on one Concept Paper and one Full Application for each Sub-Topic area of this solicitation.

Funding Requirements

The DOE monetary contribution for each project will not exceed $300,000. For demonstration projects, an industry partner must provide a participant contribution of at least 20% of the total

project funding to support industry expertise to the project. The participant contribution can take the form of monetary funds in or "in-kind" contributions and must come from non-federal sources unless otherwise allowed by law. For follow-on projects defined as a project that is using the results of a previously funded project within the HPC4EI portfolio, the industry contribution is 33.3% of the total project funding of which at least half of this amount is a cash contribution. Sample budgets are shown below. Total project size cannot exceed $500,000. DOE funding will be provided to the National Laboratory (or laboratories) in support of their work under the HPC4EI Program.

Sample Budgets

Demonstration Project (New project; total project funding of $375K)

TASK	DOE Funds	Industry Partner Cash Contribution	Industry Partner In-kind
Total Project Funding	**$300K**		**$75K**

Follow-on Implementation Projects (Uses results from a previously funded project; total project funding of $450K)

TASK	DOE Funds	Industry Partner Cash Contribution	Industry Partner In-kind
Total Project Funding	**$300K**	**$75K**	**$75K**

Note: THIS IS NOT A PROCUREMENT REQUEST.

Solicitation Process and Timeline

This solicitation comprises a two-stage process consisting of the submission and evaluation of a two-page concept paper and six-page full proposal submitted by the industrial principal investigator (PI). These will be evaluated by a technical review committee on the technical challenge to overcome; how this advances the state of the art for the industrial sector; how HPC can uniquely contribute to the solution of the technical challenge; and the company specific and broad national impact that a successful project can have. A notional project plan should be included.

Successful concept papers will be paired with a National Laboratory partner for the development of the full proposal. Full proposals will be reviewed by a technical committee against the criteria given below. The portfolio of proposals recommended by the committee will be submitted to DOE senior managers for final selection, subject to the availability of funding. All DOE funding decisions shall be final.

Upon approval of funding selections by DOE, the HPC4EI Program will issue a written response to each applicant in the form of an email. Applicants selected for funding will subsequently engage in a formal agreement with the partnered laboratory before work may begin.

Private sector applicants will engage in a DOE Short Form Cooperative Research and

Development Agreement (CRADA) for the successful proposal. Once both parties approve the Short Form CRADA, project execution may begin. Failure to engage promptly in CRADA negotiations can result in rejection of the project.

The portfolio of projects will be posted on the Program websites: www.hpc4energyinnovation.org, www.hpc4mfg.org and www,hpc4mtls.org; The HPC4EI Program reserves the right to select all, a portion, or none of the submissions.

If a concept paper or full proposal is technically strong, but is not selected for funding, the program management team may share them with other DOE program offices for consideration for possible funding through those offices.

Timeline

Current solicitation schedule dates will be posted on the HPC4EI website www.hpc4energyinnovation.org. Event dates are subject to change.

Event	Date (2020-2021)
Call for Proposal	November 19, 2020
Concept Paper Due	January 7, 2021
Request for Full Proposal	March 2021
Full Proposal Due	April 2021
Finalists Notified	June 2021
Expected Project Start	August 2021

Concept Paper Guidelines

Interested parties will submit a concept paper describing the project objectives by the due date provided above. The concept paper will be evaluated against the documented criteria. Successful concept papers will be invited to submit a full proposal.

The concept paper template can be downloaded from the HPC4EI website (www.hpc4energyinnovation.org) and the electronic proposal system (https://proposalshpc4.inl.gov). The template should be used to prepare your submission. The concept paper should not exceed two (2) single-spaced pages using 12-point Times New Roman font, 1" margins, and formatted in a PDF file. The concept paper **must include** the following components under the corresponding headings below. A concept paper that does not meet the guidelines will be rejected. A concept paper template is provided.

- **Title Page: (not included in page limit)** *Include the project title; company name, description, and U.S. manufacturing location(s); and company PI(s)'s contact information. Include the DOE office and topic area listed above that your concept paper best fits, and the National Laboratory PI contact information, if known.*

- **Abstract: (150 words or less):** *Provide a* ***non-proprietary, publishable*** *summary of the problem being addressed, why the problem is important to the energy future of the United States, a plan to address the problem, and the impact the solution will have.*

- **Background:** *Explain the technical challenge to be addressed; the state of the art in this area and how this work advances the state of the art; how solving this problem will meet the goals of the HPC4EI Program as defined by the list of topics of interest; the relevant expertise of the industry partners; what National Laboratory expertise is needed; and why National Laboratory HPC resources are required and how they will be used.*

- **Project Plan and Objectives:** *Describe the technical scope of work to be performed and how this project fits into an overall solution strategy for the challenges being addressed. Describe how the results of the project will be validated, including availability of data. If possible, identify specific simulation codes to be used in this effort.*

- **Impact:** *Estimate how this specific HPC effort will result in national-scale, long-term energy savings across the industry; the performance improvements that are expected over existing technologies; and the ability of industry to accelerate the adoption of energy-efficient technologies. Describe how this specific HPC work contributes to a transformational change in the energy sector and enduring economic impact. Describe how this effort will result in changes in the way your company operates. Describe the alternative actions if this effort is not funded including reliance on experimental technologies or other courses of action. Include metrics for energy improvements, performance increases, cost savings, and/or time reductions.*

- **Changes from Previous Submissions (Reapplications)**: *Briefly describe how you have incorporated changes based on reviewer comments from the previous submission.*

For follow-on projects, the concept paper should not exceed three (3) single-spaced pages using 12-point Times New Roman font, 1" margins, in PDF file format, and should include all of the components described above. In addition, the following component is required:

- **Results from the prior funded project (one page maximum with figures):** *Review the results and knowledge gained from the Demonstration project. Explain how these results will be used to address the objectives of this proposal. If you believe that the current proposal is distinctly different from the previous project and should not be considered as a follow-on project, please articulate the differences.*

- **Appendix A: References (not included in page count)**

Completed concept papers, derived from the provided template, must be submitted to the electronic proposal system at https://proposalshpc4.inl.gov by 5:00 p.m. PT on the deadline indicated on the submission website. Submission includes completion of electronic applicant form and upload of concept paper in PDF file format. Concept papers will be evaluated against the criteria listed in the Evaluation Criteria Section.

Full Proposal Guidelines

Successful concept paper submissions will be notified and paired with a PI from one or a combination of the following laboratories:

- Ames Laboratory
- Argonne National Laboratory
- Idaho National Laboratory
- Los Alamos National Laboratory
- Lawrence Berkeley National Laboratory
- Lawrence Livermore National Laboratory
- National Energy Technology Laboratory
- National Renewable Energy Laboratory
- Oak Ridge National Laboratory
- Pacific Northwest National Laboratory
- Sandia National Laboratories
- Other participating laboratories.

Partners will then collaborate on the development of a full proposal. Full proposals will be evaluated against the criteria described in the Evaluation Criteria Section.

The full proposal template can be downloaded from the HPC4EI website and the electronic application system. Template should be used to prepare your submission. Proposals should not exceed six (6) single-spaced pages using 12-point Times New Roman font, 1" margins, and formatted in a PDF file. The full proposal **must include** the following components under the corresponding headings below. Proposals that do not meet the guidelines will be rejected.

- **Title Page: (not included in page limit)** *Include the project title; company name, description, and U.S. manufacturing location(s); and company PI(s)'s contact information. Include the DOE office and topic area listed above that your concept paper best fits and the National Laboratory PI's contact information. Acknowledge the need to provide 20% cost-share and the agreement to enter into the DOE Model Short Form CRADA for industrial partners.*

- **Abstract: (150 words or less):** *Provide a **non-proprietary, publishable** summary of the problem being addressed, why the problem is important to the energy future of the United States, a plan to address the problem, and the impact of the solution. If selected for the HPC4EI Program, this abstract will appear on award announcements sent to the press.*

- **Background:** *Describe the technical challenge to be addressed; the state of the art in this area and how this work advances the state of the art; how solving this problem will meet the goals of the HPC4EI Program as defined by the list of topics of interest; the relevant expertise of the industry partners; what National Laboratory expertise is needed; and why National Laboratory HPC resources are required and how they will be used. Indicate if 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.*

- **Project Plan and Objectives:** *Describe the technical scope of work to be performed and how this scope will fit into the broader solution for the challenges being addressed,*

including, for example, relevant experimental work. Outline a set of tasks to be performed and state what work industry partners will perform and what work laboratory partners will perform. Describe how the results of the project will be validated, including availability of data. If possible, identify simulation codes to be used in this effort and any modifications to the software that are needed to solve the proposed problem.

- **Tasks, Milestones, Deliverables, and Schedules:** *Include goals, timelines, and due dates throughout the life of the project. Not every milestone needs to have a deliverable. Include deliverables from all partners, not just the National Laboratory partner(s). Indicate responsible party(ies) for each deliverable. Include deliverables from one partner to another, as well as those to the DOE program sponsors.*

- **Validation and Verification Plan:** *Summarize how the model will be validated and the simulations verified. Include information about the experimental data that will be used for verification, its nature and source.*

- **Impact:** *Estimate how this specific HPC effort will result in national-scale, long-term energy savings across the industry; the performance improvements that are expected over existing technologies; and the ability of industry to accelerate the adoption of energy-efficient technologies. Explain how this specific HPC work contributes to a transformational change in the energy sector and enduring economic impact. Describe the alternative actions if this effort is not funded including reliance on experimental technologies or other courses of action. Describe how this effort will specifically impact your company/entity. Include metrics for energy improvements, performance increases, cost savings, and/or time reductions.*

- **Energy Savings Estimates:** *HPC4Mfg proposals must include numerical estimates for annual energy savings. Energy savings should be on an annual basis, assuming successful implementation of the technology being enabled by the HPC effort. Estimates for market penetration used for the savings should be realistic and conservative.*

- **Implementation and Adoption:** *Describe how this work will be incorporated into company and industry-wide operations. Describe the follow-on activities to extend this effort to solve the broader problem being addressed. If a new or modified technology is developed, can the team provide a preliminary techno-economic analysis by the close of the project?*

Follow-on project proposals should not exceed eight (8) single-spaced pages using 12-point font Times New Roman font, 1" margins, in PDF file format, and should include all the components described above. In addition, the following component is required:

- **Results from the prior funded project (two pages maximum with figures):** *Review the results and knowledge gained from the Demonstration project. Explain how these results will be used to address the objectives of this proposal. If you believe that the current proposal is distinctly different from the previous project and should not be considered as a follow-on project, please articulate the differences.*

Appendixes:

- **Appendix A: References (not included in page count)**

- **Appendix B: Project Summary of Tasks and Schedule (not included in page count):** *Provide a summary of the tasks and subtasks in a table format that includes the milestones, deliverables, and schedule. Include a schedule summary in Gantt chart format.*

- **Appendix C: Project Budget (not included in page count)** *Summarize project costs including amount and source of participant contribution in the table provided. Indicate in-kind and/or cash contribution for industry funding. Include an explanation of how this funding will make a large difference relative to existing funding from other sources, including the private sector and why the government should fund this work.*

- **Appendix D: Computational Resources (not included in page count):** *Describe the computational approach, the performance of the codes, and the resources requested (platform and number of core hours). Provide information about whether the code can run efficiently on a GPU platform or requires a CPU platform. If the estimated computational resource requirement is over 10 million core-hours, please describe how these resources will be obtained.*

- **Appendix E: Pictures for Publication (not included in page count)***: Include one or two* ***non-proprietary*** *pictures/images with a short caption that can be used in a press release and posted on the website should this project be funded.*

- **Appendix F: Discussion of How This Work Benefits the Laboratory (not included in page count):** *Briefly discuss new or enhanced capabilities that will be gained by the partner laboratory. Or, explain how this will help to maintain existing laboratory capabilities.*

- **Appendix G: (not included in page limit):** *Include one paragraph* ***non-proprietary*** *biography for both the industrial PI and partnering laboratory PI. These may be posted on the website should this project be funded.*

- **Appendix H: Resumes (not included in page limit):** *Include resumes of participants.*

Completed proposals, derived from the provided template, must be submitted to the electronic proposal system at https://proposalshpc4.inl.gov by 5:00 p.m. PT on the deadline indicated on the submission website. Submission includes completion of electronic applicant form and upload of full proposal in PDF file format. This date will be approximately five weeks after concept paper notifications have been issued.

Evaluation Process and Criteria

Both concept papers and full proposals will be evaluated by a Technical Merit Review Committee consisting of experts in the application of HPC modeling, simulation, and data analysis from each of the principal DOE National Laboratories, and members of the DOE program offices with knowledge of the U.S. industry. Subject Matter Experts will be consulted to verify claims, including the description of current state of the art and estimate of project impact (e.g., cost and energy savings).

Concept papers will be evaluated primarily on the technical challenge and potential impact of using HPC to solve the industrial challenge. Concept papers should articulate, to the extent

possible, the technical plan for performing the work. The committee recognizes that those industrial PIs who have not yet identified a National Laboratory partner to work with may not have a complete picture of the technical solution techniques that are possible.

Full proposals will be evaluated against all of the criteria listed below. Because the industrial partner will have been assigned a laboratory partner to work with to develop the full proposal, the technical plan and feasibility will be expected to be well articulated. In addition, strong evidence of communication and planned collaborations between the National Laboratory and industrial participants is expected in the full proposals.

Final funding decisions will be made by the sponsoring DOE office. DOE reserves the right to fund none, one several or all of the submitted proposals. All DOE funding decisions will be final.

Evaluation Criteria

- **Advances the State of the Art in the Industrial Sector**: (Weight 20%)
    - Does the proposed work take the industrial sector to a new level; provide a wholly new capability; or make an existing, energy-intensive technology obsolete in the manufacturing sector?
    - Does the proposed work take materials performance and behavior to a new level in a specific energy application environment; scale up the production of anew or modified material; provide a wholly new capability; or dramatically decrease the time required to certify or qualify a new or modified material?
    - Is the technical readiness level appropriate for a one-year project to produce meaningful results for the industrial sector?

- **Technical Feasibility**: (Weight 20%)
    - Does the proposal have a clearly stated technical approach including a description of the software to be used and any needed modifications?
    - Does the proposal match team expertise to the problem to be solved; have modeling expertise on both the National Laboratory and industry sides, and process experts for the model validation if necessary?
    - Does the proposal clearly state roles and responsibilities for the participants and provide evidence of a strong collaboration between the industrial and national partners through joint milestones and deliverables?
    - Is the project plan clearly constructed with realistic time frames for each technical step?
    - Is there a solid verification and validation plan with validation data available?

- **Relevance to HPC**: (Weight 20%)
    - Does the proposed work fully utilize the unique expertise and capabilities at the DOE National Laboratories to solve a problem that could not be solved in any other way?
    - Does it demonstrate the ability to use large fractions of the machine to solve a truly large-scale problem and provide clear estimates of the compute cycles necessary for the work to be performed?

- **Impact, Including Life-Cycle Energy Impact**: (Weight 40%)

    - Does the proposal respond to the specific topic areas listed and interests of the DOE sponsor office?
    - Does the proposal provide clear, evidence-based energy savings that will a *have broad (national-scale) industrial impact* through development and/or improvement of energy-efficient manufacturing technologies, as well as an impact on employment and manufacturing in the United States?
    - Does the proposal have a clearly stated plan for broad deployment of project artifacts or knowledge gained? Are specific numerical energy metrics included with a solid justification for the impact estimates?
    - Does the proposal provide clear, evidence-based improved materials performance, energy savings, or reduced time to market that will *have broad (national-scale) industrial impact, as well as an impact on employment* in the United States?
    - Does the proposal have a clearly stated plan for broad deployment of project artifacts or knowledge gained?

Point of Contact

During the period of the call for proposals, all questions relating to this announcement should be directed to the HPC4EnergyInnovation Program at hpc4ei@llnl.gov. To avoid compromising the solicitation process, public and private sector partners interested in submitting applications should refrain from contacting National Laboratory proposal partners regarding proposal content while the call for proposals is open.

Intellectual Property and Proprietary Data

The HPC4EI Program respects the importance of industry's intellectual property and data security.

Industrial partner awardees are expected to enter into a DOE Model Short Form CRADA with the National Laboratory or Laboratories that will be performing the work. This CRADA contains provisions relating to proprietary information and intellectual property. Because of the need for accelerated placement and execution of the projects, terms of the CRADA will not be subject to negotiation. To review the proposed terms that make up the DOE Model Short Form CRADA, please see the example posted on the HPC4EI solicitation website.

A Non-Disclosure Agreement can be put into place during development and submission of the proposal to facilitate discussions while protecting the partner's proprietary information.

To the extent possible, it is preferred that proprietary information NOT be included in the submitted proposal. If company proprietary information is included in the proposal, the specific information should be marked as such. The HPC4EI Program officials will utilize reasonable efforts to treat the information as business sensitive.

Significant delays by the industry partner to finalize the CRADA could result in rejection of the proposal.