National Laboratories Partner with U.S. Manufacturers to Increase Innovation and Energy Efficiency

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Today’s Agenda

10:00 – 10:05 PST Welcome and webinar instructions

10:05 – 10:30 PST Overview of program

10:30 – 11:00 PST Q&A

Participant instructions

- Please turn off video and mute your phone
- Questions will be answered at the end of the briefing
  - Send to “All Participants” via Chat
HPC4Mfg and HPC4Mtls are part of a growing HPC4EnergyInnovation Umbrella

1st Joint Solicitation

Future Growth
The DOE national labs have some of the largest computers in the world and significant technical expertise offering the benefits of HPC to U.S. Industry

- Accelerate innovation
- Optimize design
- Reduce testing cycles
- Shorten the time to market
- Quality processes
- Reduce waste/reduce rejected parts
- Lower energy costs

Enhance U.S. economic competitiveness, create quality manufacturing, engineering and science jobs
The HPC4 Program is building an ecosystem to support HPC adoption by industry

- Showing what is possible with HPC through **demonstration projects**
  - DOE program office funds < $300K to laboratories (like a voucher program)
  - Industry funds at least 20%; either in-kind support or optional cash contribution
  - Project duration < one year

- Building the HPC4 community
  - Student intern programs
  - Workshops
Program Approach – Companies apply to program through a solicitation process

Engage industry

- Industry submits challenges
- Match challenge to PI
- AMO approval; Feedback to industry
- Sign agreements

Inform industry

Concept paper → Full proposal → Award

Technical Review Committee

**Technical Merit Review Committee**

- Partner labs and DOE representatives
- Heavy focus on **nation-wide** impact to energy efficiency and clean energy technology industry-wide
- $300K DOE funds Laboratory PIs
- 20% in-kind from industry partner
Program Details: Eligibility and Funding

- **Eligibility for call**
  - Companies manufacturing or developing materials in the U.S.

- **Who can be funded from the program**
  - National laboratories
  - *University collaborators must be funded by the industry partner.*

- **Industry participant cost share**
  - At least 20% of project funding for new projects
  - At least 50% of project funding for follow-on projects
  - Can be used to support internal staff
  - *Source cannot be other federal funding*
Program Details: DOE Model Short Form CRADA

- Used for accelerated placement and execution
- Scope and IP protection defined
- Industry awardees required to sign DOE Model Short Form CRADA
- Objections to terms and conditions can be stated in concept paper; however, this could lead to delays and rejection of proposal
- Standard DOE Model Short Form CRADA available on the web site
  - Individual labs may have some variances
  - If concept paper is selected to go forward; the specific CRADA for your laboratory will be sent to you
The HPC4Mfg solicitation topics directly align with DOE’s Advanced Manufacturing Office goals to save energy

**Broad impact on energy efficiency and/or productivity:**
- Use HPC to overcome a key technical challenge
- Existing process optimization
- Advanced product design
- Predicting performance and failure rates
HPC4Materials focuses on topic areas of interest to sponsoring DOE offices

**Fossil Energy Technologies:**
- Materials for severe thermal and corrosive environments
- Kinetics of materials degradation
- Scale up of production of new materials
- High entropy alloys
- Qualification and certification of new materials

**Fuel Cell Technologies:**
- Improved performance and durability of electrocatalysts
- Advanced water splitting technologies
- Machine learning to predict new material performance
- Interactions in complex systems

**Vehicle Technologies:**
- Microstructure of cast materials
- Machine learning to identify new material compositions
- Improved high temperature alloys
- Dissimilar materials joints
- Aging of adhesives
Nearly 70 projects have been funded with over 38 industrial partners

- Sponsored by DOE Office of Energy Efficiency & Renewable Energy (EERE) and Office of Fossil Energy (FE)

- >$20M technical portfolio
  - Executing on nearly 60 projects with 38 industry partners and 9 national laboratories
Concept papers are the first step:

- Two-pages; single spaced; 12 pt. font – **Use the template at** [http://hpc4mfg.org](http://hpc4mfg.org) or [http://hpc4mtls.org](http://hpc4mtls.org)

- **Key Elements**
  - **Title page**
  - **Abstract** (150 words or less) - must be non-proprietary, publishable summary
  - **Background**
    - Technical challenge to be addressed
    - State of the art in manufacturing in this area and how this work advances the state of the art
    - Why national laboratory expertise and HPC resources are needed
  - **Project Plan and Objectives**
    - Technical scope of the work and how this project fits into the overall solution strategy
    - How results will be validated including availability of data
    - Specific simulation codes that will be used if known
  - **Impact**
    - How this effort results in long-term energy savings or
    - Ability to accelerate innovative energy-efficient manufacturing
    - Metrics include cost savings, energy savings, and improvement in energy intensity

**You do not need to identify a laboratory partner up front!**

*Just an interesting and hard problem that HPC can help address!*
Full proposals provide much more detail

- Six-pages; single spaced; 12 pt. font – **Use the template at** [http://hpc4mfg.org](http://hpc4mfg.org) or [http://hpc4mtls.org](http://hpc4mtls.org)

- Key Elements
  - **Title page**
  - **Abstract** (150 words or less) - must be non-proprietary, publishable summary
  - **Background**
    - Similar to concept paper
  - **Project Plan and Objectives**
    - Similar to but more detailed than concept paper with specific tasks; specific simulation codes; modifications to the software needed etc.
  - **Tasks, Milestones, Deliverables and Schedules**
    - Goals, timelines and due dates of milestones and deliverables from all partners; responsible party, communication from one partner to another
  - **Verification and Validation Plan**
    - How do you intend to validate the findings of the model
  - **Impact**
    - Similar to concept paper but more detailed; is this transformational for an industrial sector; what is the enduring impact; how will results be disseminated
  - **Implementation**
    - How will this be incorporated into company and industry-wide operations; follow on activities to extend this effort to solve the broader problem being addressed
  - Various appendices (see next slide)
Appendices provide additional information

- Used in the review process; CRADA development process; compute resource determination, etc.

- Not included in the six-page limit

- **Appendix A**: Project summary of tasks and schedule (similar to project tasks in main proposal, but used for CRADA development)

- **Appendix B**: Project budget: costs, amount and source for participants, cost share (in-kind or cash); how funding makes a difference relative to existing funding

- **Appendix C**: Computational resources: computational approach, performance of the codes, resources requested (platform and core hours)

- **Appendix D**: Pictures for publication (Photos are often used for program announcements)

- **Appendix E**: How the work benefits the laboratory

- **Appendix F**: Paragraphs biographies of industry and lab lead PIs

- **Appendix G**: Resumes of key participants
Program Details: Evaluation criteria

How to maximize your score

- **Advances the current “State of the Art” in the industrial sector**: takes the industrial sector to a new level; provides a wholly new capability; or makes an existing technology obsolete

- **Technical feasibility**: clearly stated technical approach; description of the software including needed modifications; clearly stated roles and responsibilities; realistic timeframes; available validation data

- **Relevance to high performance computing**: utilizes unique expertise and facilities at DOE labs; solves a problem that could not be solved otherwise; can use large fractions of the HPC facility to solve a large-scale problem; clear estimates of the compute cycles needed

- **Impact, including Lifecycle Energy Impact**: clear, evidence-based energy savings with broad (national scale) impact; impact on employment and manufacturing; clear statement of the deployment plan

- **Project management and team**: team expertise matches the problem to be solved; modeling expertise on both lab and industry side; experts for model validation if necessary; clearly stated roles and responsibilities; evidence for strong collaboration through joint milestones
Success stories from recent projects

**GE**: larger, higher fidelity turbine design using advanced turbulence models

**ZoomEssence**: new food particle dryer configuration using advanced CFD

**Vitro Glass**: real time control of glass furnace using deep-learning tools

**P&G**: faster modeling of paper towel drying process using parallel computing
Visit our websites for solicitation details

Concept paper deadline is December 18, 2018

Additional information at:
http://hpc4energyinnovation.org
http://hpc4mfg.org
http://hpc4mtls.org

Questions can be sent to:
hpc4ei-submissions@llnl.gov

Join the distribution lists via the web to receive program announcements
hpc4ei-info@llnl.gov
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