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

Robin Miles, HPC4Mfg Interim Director
Today’s Agenda

8:00 – 8:05 PDT Welcome and webinar instructions
8:05 – 8:30 PDT Overview of program
8:30 – 9:00 PDT Q&A

Participant instructions

▪ Please turn off video and mute your phone
▪ Questions will be answered at the end of the briefing
  • Send to ”Everyone” via Chat
The HPC4Mfg Program is designed to bring the many benefits of high performance computing to U.S. Industry

- Accelerate innovation
- Improve processes
- Optimize design
- Reduce testing cycles
- Shorten the time to market
- Reduce waste/reduce rejected parts
- Lower energy costs
The HPC4Mfg Program is building an ecosystem to support HPC adoption by industry

- Showing what is possible with HPC through demonstration projects
  - AMO funds < $300K to laboratories
  - Industry funds at least 20%; either in-kind support or optional cash contribution
  - Project duration < one year

- Encouraging the adoption of HPC through follow-on projects
  - AMO funds < $300K to laboratories
  - Industry funds at least 50%; at least half of which is a cash contribution
  - Project duration: one to two years

- Building the HPC Manufacturing community
  - Industry Engagement Day
  - Student intern programs
Our unique approach to building teams helps ensure each project’s success

Engage industry

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

Inform industry

- Technical Review Committee
  - Concept paper → Full proposal → Award

Technical Merit Review Committee
- Partner labs and AMO representatives
- Heavy focus on nation-wide impact to energy efficiency and clean energy technology industry-wide

Execution streamlined through the required use of the DOE Model Short Form Cooperative Research and Development (CRADA)
Program Details: Eligibility and Funding

- Eligibility for call
  - Companies manufacturing in the U.S.

- Who can be funded from the program
  - National laboratories
  - In limited amounts, U.S. universities with unique skills not found at national laboratories, via sub-contract as collaborators

- 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 can not 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 partnering laboratory will be sent to you
Solicitation Round 6 focuses on steel and aluminum primary and secondary manufacture

Broad impact on energy efficiency and/or productivity:
- use HPC to overcome a key technical challenge
- New or existing process optimization
- predicting performance and failure rates

Projects should articulate the national scope of impact of a successful outcome and how HPC/laboratory expertise uniquely contributes to that outcome.
Typical funded projects in the primary/secondary metal category

<table>
<thead>
<tr>
<th>Company</th>
<th>Proposal Title</th>
<th>Project Goal</th>
<th>Industrial Sector</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Manufacturing Simulation and Visualization Consortium (SMSVC)</td>
<td>The Virtual Blast Furnace Simulation</td>
<td>Optimize steel blast furnace to lower coke usage, process costs and reduce carbon loads to the environment</td>
<td>Primary Metals - Steel</td>
<td>Metal Refining</td>
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<tr>
<td>Arconic Inc.</td>
<td>Computational Modeling of Multi-Strand Aluminum DC Vertical Casting Processes Incorporating Cast Structure and Thermal Treatment Effects Contributing to Rework Energy Losses</td>
<td>Model casting process of aluminum ingots to eliminate cracking and increase yield</td>
<td>Primary Metals - Steel</td>
<td>Metal Refining</td>
</tr>
<tr>
<td>Arconic Inc.</td>
<td>High Performance Computing for Phase Predictions for Multi-Component Alloy System.</td>
<td>Use first principle modeling to develop high-melting-point, lightweight aluminum alloys</td>
<td>Primary Metal - Al</td>
<td>Casting</td>
</tr>
<tr>
<td>Shiloh Ind.</td>
<td>Development of a Transformational Micro-Cooling Technology for High-Pressure Die Casting using High-Performance Computing</td>
<td>Study phase change cooling of aluminum casting tooling to speed up casting processes</td>
<td>Primary Metal - Al</td>
<td>Casting</td>
</tr>
<tr>
<td>SFP Works, LLC (dba Flash Bainite)</td>
<td>HPC4Mfg to Optimize Phase Transformations During Flash Processing</td>
<td>Model phase transformations in novel steel strengthening technique to optimize process</td>
<td>Primary Metals - Steel</td>
<td>Heat Treatment</td>
</tr>
<tr>
<td>Arconic Inc.</td>
<td>Computational Modeling of Industrial Rolling Processes Incorporating Microstructure Evolution to Minimize Rework Energy Losses</td>
<td>Model aluminum sheet rolling to understand void formation and fate to improve yield</td>
<td>Primary Metal - Al</td>
<td>Casting</td>
</tr>
<tr>
<td>ArcelorMittal USA</td>
<td>Application of High-Performance Computing (HPC) to Optimize Reheat Furnace Efficiency in Steel Manufacturing</td>
<td>Optimize steel sheet reheat process to improve process flexibility and product quality</td>
<td>Primary Metals - Steel</td>
<td>Rolling</td>
</tr>
</tbody>
</table>
Concept papers are the first step:

- Two-pages; single spaced; 12 pt. font – Use the template at www.hpc4mfg.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; how this program advances that; why national lab HPC resources are required; expertise of industry partners, etc.
  - 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 www.hpc4mfg.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, Schedules, Milestones, and Deliverables
    - Goals, timelines and due dates of milestones and deliverables from all partners; responsible party, communication from one partner to another
  - 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**: Resumes of key participants
Program Details: Evaluation criteria (or 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.
For more information on the HPC4Mfg Program

Additional information at www.hpc4mfg.org

Questions can be sent to hpc4mfg@llnl.gov

Join the hpc4mfg-info@llnl.gov distribution list via the web to receive program announcements

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- Please mute your phone when not speaking
- Questions: Send to "Everyone" via Chat