



ENERGY INNOVATION



MANUFACTURING



MATERIALS

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

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U.S. DEPARTMENT of ENERGY

Office of Critical Minerals and Energy Innovation



U.S. DEPARTMENT of ENERGY

Hydrocarbons and Geothermal Energy Office

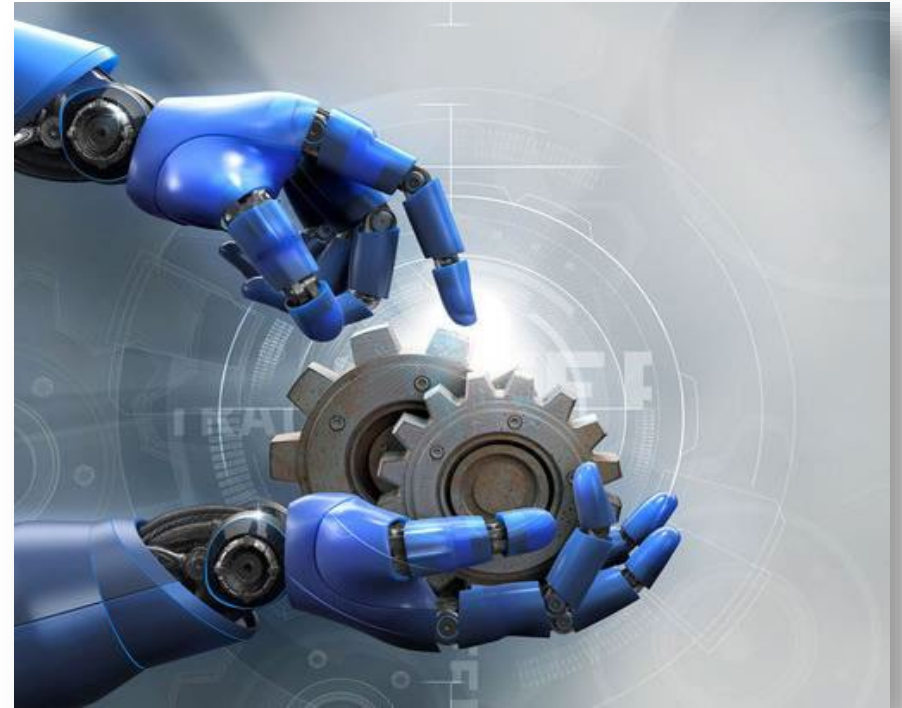
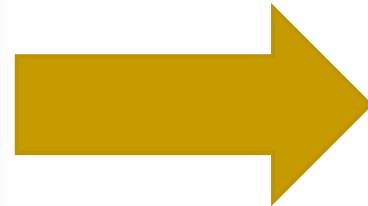


U.S. DEPARTMENT of ENERGY

Office of Science

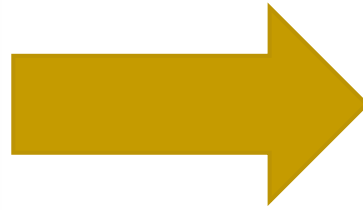


U.S. industry is undergoing a technological revolution



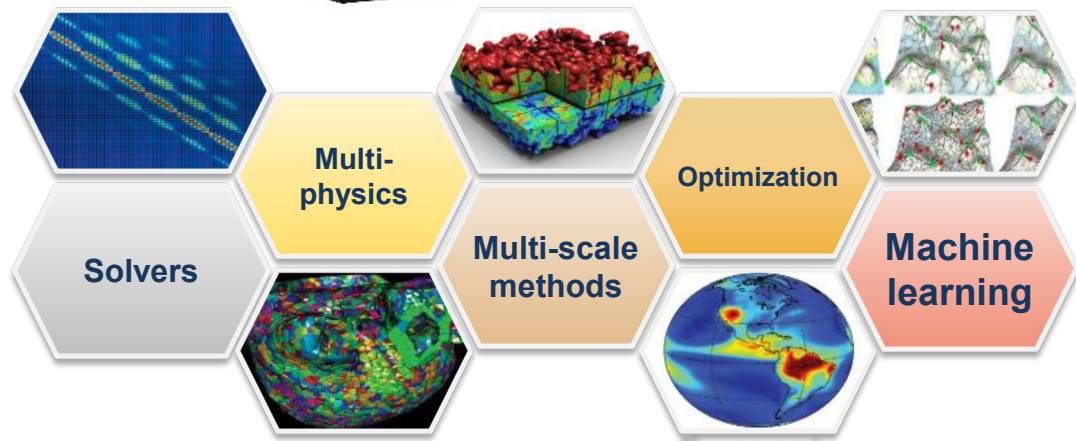
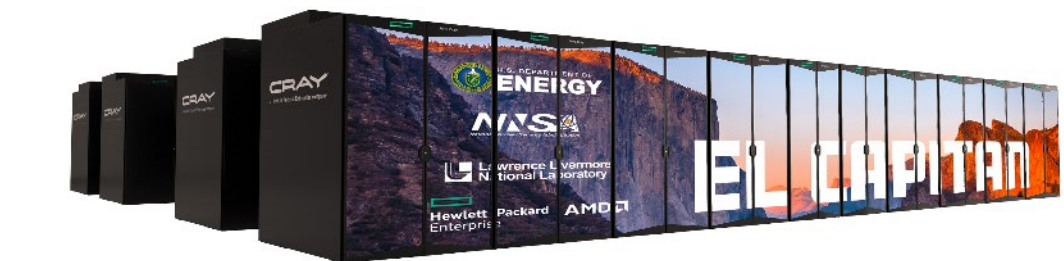
Computer Simulation – Data Analytics/AI – Material Discovery

We are advancing the energy agenda through advanced simulation



Computer Simulation shortcuts the Edisonian approach

HPC4EI connects the DOE HPC ecosystem to U.S. industry



World-class supercomputers
Unique software
Subject Matter Experts





Utilizing DOE computing capabilities to help 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
- ▶ Reduced carbon emissions

The HPC4 Program is building an ecosystem to support HPC adoption by industry/government

- ▶ Showing what is possible with HPC through initial projects
 - ▶ DOE program office funds < \$400K to laboratories
 - ▶ Industry funds at least **20% of total project funding**; either in-kind support or optional cash contribution
 - ▶ Project duration one year
- ▶ Building the HPC4 community
 - ▶ Student intern programs
 - ▶ Hosting virtual and hybrid events



HPC 4 ENERGYINNOVATION

HPC 4
MANUFACTURING

HPC 4
MATERIALS



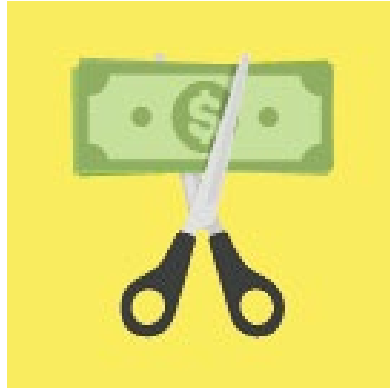
U.S. DEPARTMENT
of **ENERGY** | Office of Critical Minerals
and Energy Innovation



U.S. DEPARTMENT
of **ENERGY** | Hydrocarbons and
Geothermal Energy Office

Program Approach

Companies apply to program through a solicitation process



- DOE funds 2 solicitations a year
- \$400K / Project funded
- ~\$11M /yr Budget
- 12 National laboratories participating
- 200+ projects funded with 100+ companies over 10 years

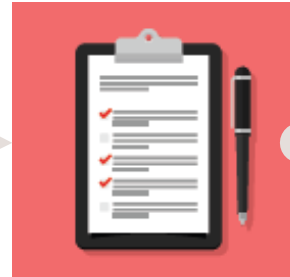
Industry
Concept Paper



PI Match
Full Proposal



Technical
Review



Signed
Agreement



PI obtains HPC
resources



Over 200 projects have been funded with over 90 manufacturers in US



- ▶ Aerospace leading edge companies
- ▶ Legacy industries
- ▶ Innovative small companies

Rapid-Prediction AI for Hot-Rolled Steel

Rolling hot, cast ingots into sheet steel is a tricky business.

At each deformation stage, cooling requirements must be predicted to yield the right grain structure, material properties, quality, and final control.

LLNL and AK Steel developed an HPC version of a legacy prediction tool. The “HSMM-HPC” completes a full-coil simulation in under a minute, predicts properties and quality based on ~1000 control variables, and trains an AI system that makes real-time predictions in fractions of a second.



LAWRENCE LIVERMORE NATIONAL LABORATORY
WITH AKS, INC.



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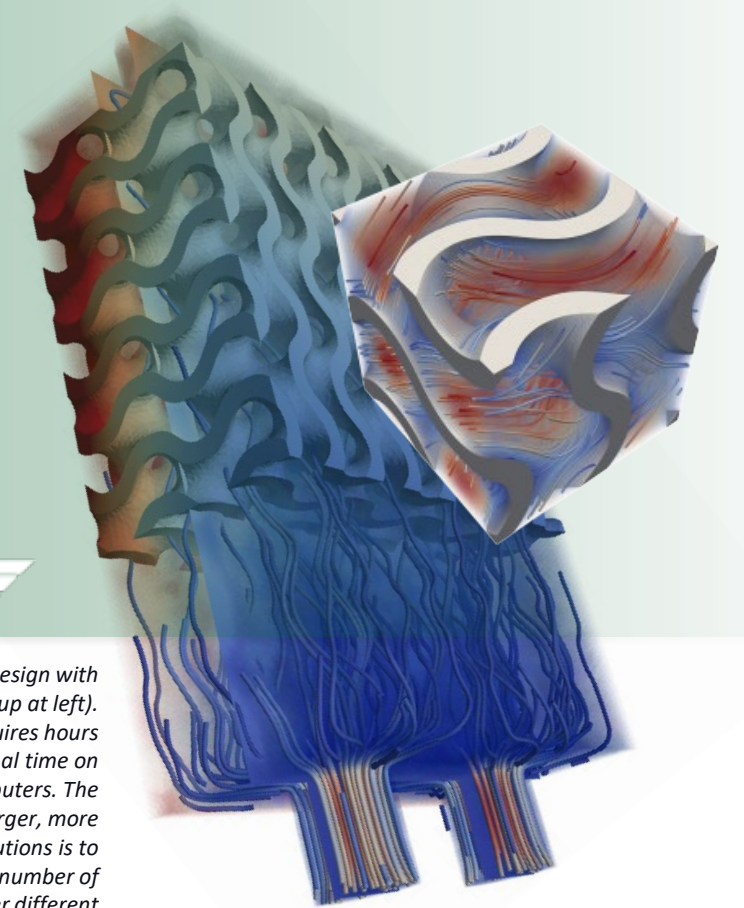
- Typical mill may save 10% of 145,000 MBTUs used annually
- Besides direct E conservation, enormous savings from improved productivity expected
- Remakes drastically reduced—waste of time, energy, money, trust avoided

Energy Savings for Automotive AC Heat Exchangers

Air conditioning guzzles fuel—up to 30% in internal-combustion engines and 40% of battery range in electrics.

This long-recognized problem was tackled by Materials Sciences, LLC, and Lawrence Livermore National Laboratory with breakthrough results.

The team deployed topology optimization, additive manufacturing, machine learning, and ultra-high-powered computers to optimize exchanger physics and slash compressor energy consumption by 30%.



3D heat-sink design with periodic cells (blowup at left). Detailed analysis requires hours of computational time on LLNL's biggest computers. The solution for larger, more realistic cell distributions is to analyze an extensive number of small unit cells under different flow regimes and wall-thickness parameters and derive a homogenized model for simulating the response of the exchanger

IMPACT

- Decreases fuel consumption in gas engines by 10%, extends e-car battery range by 13%.
- Adopted nationally by car makers, could yield annual 9.2% gas savings.
- Technology is adaptable to many heat-exchange applications.

Energy Savings for Nonwoven Manufacturing

Nonwoven materials are unrivaled for many uses, notably medical protective gear such as N95 masks. Industry leader 3M joined Argonne National Lab to slash energy consumed in manufacturing through high-powered computing.



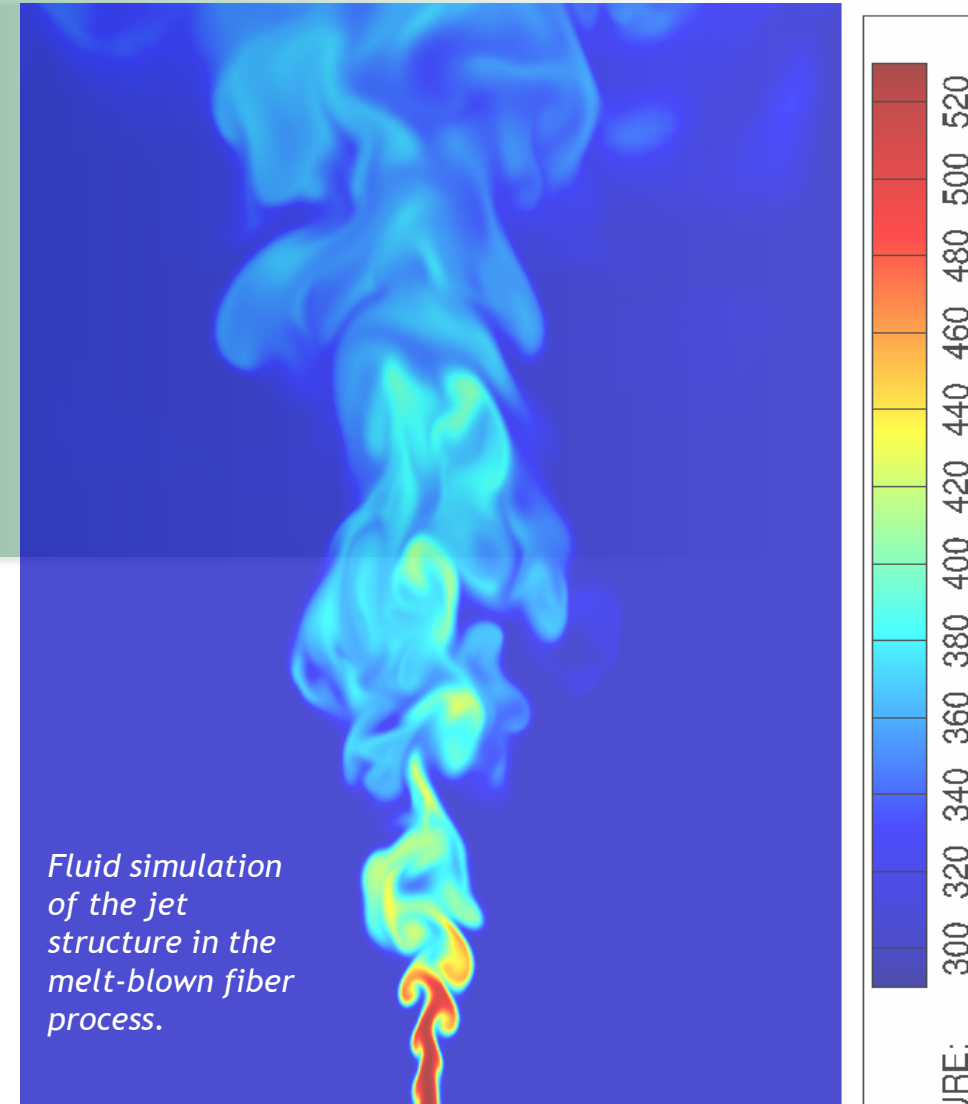
ARGONNE NATIONAL LABORATORY
3M COMPANY & U CHICAGO



Funded through the HPC4 Energy Innovation Program
hpc4energyinnovation.llnl.gov

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- Energy goal of 20% savings well within reach—could be as high as 50%.
- 49 GWH savings expected annually from 3M alone
- HPC-driven computational fluid dynamics quickly resolves the wickedly complex physics of nonwoven-materials production.
- New energy and cost-cutting methods expected to revolutionize entire industry.



Program Details: If Awarded DOE Model Short Form CRADA

- ▶ Industry awardees required to sign DOE Model Short Form Cooperative Research and Development Agreement (CRADA)
- ▶ Used for accelerated placement and execution
- ▶ Scope and IP protection defined
- ▶ Standard DOE Model Short Form CRADA available on the website
 - ▶ Individual labs may have some variances
 - ▶ If concept paper is selected to go forward; you can ask your laboratory partner for a copy of the specific CRADA



DOE O 483.1B
12-10-2016

Attachment 5
Page 5-1

ATTACHMENT 5

This Attachment provides information and/or requirements associated with DOE O 483.1B Chg 3 as well as information and/or requirements applicable to contracts in which the associated CRD (Attachment 1 to DOE 483.1B Chg 3) is inserted.

MODEL SHORT FORM CRADA

This Model Short form CRADA is designed to be offered to entities as means for streamlining and simplifying the CRADA process for certain circumstances. In order to ensure expedited CRADA development and approval, this document must be adopted in its entirety, as written, by both/all parties with no exceptions. The language of this document is pre-approved by DOE; however, the DOE field office can approve minor changes specific to a Laboratory or other facility. The goal is for uniformity across the DOE complex with this CRADA with limited differences between Laboratories and other facilities.

The Short Form CRADA may be offered to entities that meet the following criteria:

- H. The Participant should be clearly advised that this CRADA must be adopted in its entirety, as written, by both/all parties and, at the same time, advised of the alternative to use the DOE Model CRADA if the total terms of the Short Form CRADA are not agreeable.*
- I. The dollar value of the entire project (including amendments) does not exceed \$2,000,000. This dollar value may be periodically adjusted by the HQ Office of Procurement Policy (MA).*

The Short Form CRADA package will be subject to the same process used for DOE Model CRADA package review and approval at the cognizant DOE field element.

Guidance for the DOE Model CRADA applies to clauses unchanged in the Short Form CRADA.

For each project, a Statement of Work (SOW) is required that details the nature, scope, roles, responsibilities, and costs of activities to be conducted by both parties together with an estimated timeline for completion of identified tasks. The SOW will be incorporated into the CRADA as Annex A.

Program Details: Eligibility and Funding

- ▶ Eligibility for call
 - ▶ Companies manufacturing or developing materials in the U.S.
- ▶ Who can be funded from the program
 - ▶ DOE National Laboratories
 - ▶ **University collaborators can be funded by the industry partner or DOE National Laboratory**
 - ▶ If the funding for a university or non-profit participant is to be provided by DOE through the DOE laboratory partner, funding requests must be less than half of the total DOE funds. 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.
- ▶ Industry participant cost share
 - ▶ At least 20% of **total** project funding (can be in-kind)
 - ▶ Follow-on projects require at least half of cost share in cash
 - ▶ Can be used to support internal staff
 - ▶ ***Source cannot be other federal funding***



Updated budget table on full proposal template Phase I Project



Cost Category	DOE Funds	Industry Partner Cash Contribution	Industry Partner In-Kind	Total Project Funding
National Lab Labor	368,000			
National Lab Travel	2,000			
National Lab HPC (include platform and #core hours)				
National Lab Procurements				
National Lab Licenses				
National Lab Subcontracts (University and/or Non-profit Funding)	30,000			
Industry Partner Labor			100,000	
Industry Partner Procurements				
Industry Partner Subcontracts				
Industry Partner Licenses				
Totals	400,000		100,000	500,000

- Sum of Cash and In-kind must be 20% of total project funding $(100,000 + 0) / 500,000 = 0.2$
- For initial projects cash contributions are not a requirement

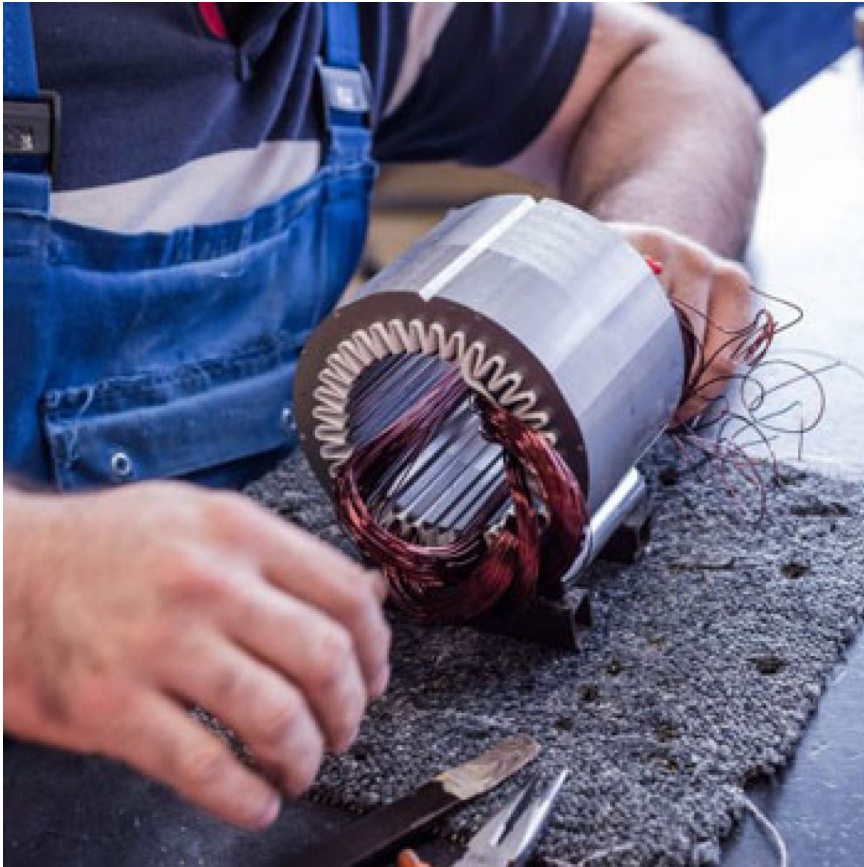
Updated budget table on full proposal template Phase II Project



Cost Category	DOE Funds	Industry Partner Cash Contribution	Industry Partner In-Kind	Total Project Funding
National Lab Labor	368,000	50,000		
National Lab Travel	2,000			
National Lab HPC (include platform and #core hours)				
National Lab Procurements				
National Lab Licenses				
National Lab Subcontracts (University and/or Non-profit Funding)	30,000			
Industry Partner Labor			50,000	
Industry Partner Procurements				
Industry Partner Subcontracts				
Industry Partner Licenses				
Totals	400,000	50,000	50,000	500,000

- At least half of the contribution in Phase II projects must be cash
- Sum of Cash and In-kind must be 20% of total project funding $(50,000 + 50,000)/500,000 = 0.2$

Advanced Materials & Manufacturing Technologies Office



The Advanced Materials & Manufacturing Technologies Office (AMMTO) strengthens America's manufacturing and industrial base by advancing innovation that supports energy security and global competitiveness.

- Support reliable, affordable, and secure energy systems
- Advance materials innovation and manufacturing technologies
- Promote workforce development
- Support secure energy supply chains

Projects should address one or more of the topic areas listed in the solicitation

HPC4Manufacturing AMMTO Topics of Interest

Development of advanced materials to improve the performance, durability, and cost effectiveness of energy systems and technologies

- Qualification and certification barriers
- Scaling and manufacturing challenges
- Critical materials and critical minerals for energy manufacturing
- System performance in demanding environments
- Leveraging smart manufacturing and digitally-enabled technologies
- Leveraging smart manufacturing
- Supply chain and cost barriers

Development of manufacturing processes to strengthen U.S. industrial competitiveness and energy security

- Cost and throughput barriers
- Time-to-market and qualification barriers
- Quality challenges
- Integration of advanced digital tools into manufacturing processes
- Supply chain security

Projects should address one or more of the topic areas listed in the solicitation

Industrial Technologies Office



The Industrial Technologies Office (ITO) strengthens U.S. industry by funding secure, cost-effective industrial technologies that improve competitiveness and support innovation across the sector.

- Fund research, development, and demonstration (RD&D)
- Help energy-intensive industries overcome barriers
- Support technologies applicable across multiple industries
- Advance technology innovation and strategic analysis

HPC4Manufacturing ITO Topics of Interest

Technologies that significantly improve productivity optimization in energy-intensive industries for manufacturing competitiveness.

- Chemical Fuels
- Iron and Steelmaking, Aluminum, and Other Metals
- Food and Beverage Products
- Cement and Concrete, Asphalt, and Glass
- Forest Products

Equipment and processes that improve industrial process heating, including reducing cost, improving efficiency, or enhancing product quality.

- Electrified or hybrid heating
- Heat upgrading technologies
- Utilization of on-site fuels
- Heat exchangers
- Efficient fuel-flexible combustion system designs

Non-thermal processes for cost-competitive separations and treatments.

- Membrane separations
- Other technologies that significantly reduce or eliminate the heat needed for industrial processes
- Improvements to other energy-intensive non-thermal equipment and processes

Industrial technologies that can ensure grid reliability in the face of industrial demand growth.

- Technologies that enable flexible industrial energy use
- Thermal energy storage technologies
- Technologies that can reduce the electrical demand of data center operations

Technologies at the water-energy nexus that enable production of fit-for-purpose water.

- Equipment, control systems, processes, and treatment trains
- Technologies that reduce the direct water consumption of data centers

Opportunities across the areas of interest above to leverage emerging artificial intelligence and machine learning methods.

- Use of AI to accelerate R&D and optimize processes within these domains.

Projects should address one or more of the topic areas listed in the solicitation

Concept papers are the first step:

2 pages; single spaced; 12 pt. font - Use the template provided on HPC4EI website and HPC4EI Proposal System

Key Elements

- ▶ **Title page**
- ▶ **Abstract** (150 words or less) - must be a non-proprietary, publishable summary
- ▶ **Background**
 - ▶ Technical challenge to be addressed
 - ▶ State of the art in manufacturing 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 HPC effort will lead to national impact
 - ▶ Provide evidence-based benefits - energy cost savings productivity improvements, development improvement of manufacturing
 - ▶ Describe additional impacts this work will have on manufacturing and HPC communities
- ▶ **Phase II Projects (Follow-on Projects) - 1 additional page**
 - ▶ Review results and explain how the results will be used to address the objectives of the current proposal

Following sections not included in page count

- ▶ **Appendix A: Quantitative Analysis**
- ▶ **Appendix B: Changes from Previous Submission (Reapplication)**
- ▶ **Appendix C: References**

***You do not need to identify a laboratory partner up front!
Just need an interesting and difficult problem that HPC can help address!***

Full proposals provide much more detail

8 pages; single spaced; 12 pt. font - The template will be available in the HPC4EI Proposal System after the Concept Paper results are distributed.

Key Elements

- ▶ **Title page**
- ▶ **Abstract** (150 words or less) - must be non-proprietary, publishable summary
- ▶ **Background**
 - ▶ Similar to concept paper
- ▶ **Phase II Project Proposals Only** (two additional pages maximum with figures):
 - ▶ Review the results and knowledge gained from the Phase I project
- ▶ **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, including who is the responsible party for each deliverable and what will be communicated between the partners
- ▶ **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 and how; what is the enduring impact; how will results be disseminated
- ▶ **Implementation and Adoption**
 - ▶ How will this be incorporated into company and industry-wide operations; and 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 8-page limit
- ▶ **Appendix A:** References (not included in page count)
- ▶ **Appendix B:** Project summary of tasks and schedule (similar to project tasks in main proposal, but used for CRADA development)
- ▶ **Appendix C:** Project budget: costs, amount and source for participants, cost share (in-kind or cash); how funding makes a difference relative to existing funding
- ▶ **Appendix D:** Computational resources: computational approach, performance of the codes, resources requested (platform and core/node hours)
- ▶ **Appendix E:** Pictures for publication (Photos are used for program announcements)
- ▶ **Appendix F:** How the work benefits the laboratory
- ▶ **Appendix G:** Paragraph biographies of industry and lab lead PIs
- ▶ **Appendix H:** Resumes of key participants
- ▶ **Appendix I:** Improvements for Previous Full Proposal Submission

How to Submit Your Application in the HPC4EI Proposal System

Access the electronic proposal system at proposalshpc4.inl.gov or HPC4EI Solicitation website

Event	Date
Call for proposal	April 28, 2026
Information Webinar #1	May 5, 2026 11:00 a.m. (PT) Register
Information Webinar #2	May 6, 2026 11:00 a.m. (PT) Register
Concept Paper Deadline	May 27, 2026 5:00 p.m. (PT)
Request for Full Proposal (Invitation Only)	July 2026
Full Proposal Due	August 2026
Finalist Notified	October 2026
Expected Project Start	December 2026

Create account, email verification process, and complete general account information. For improved security, all accounts require a verification code on login.



Create Application in HPC4EI Proposal System

The screenshot shows the HPC4EI Proposal System interface. At the top, there is a navigation menu with 'Applications' highlighted in a red box. Below the menu, there are two main sections: 'Current Open Calls' and 'Your Applications'. The 'Current Open Calls' section contains a table with columns for 'Call Name', 'End Date', and 'Fiscal Year'. The 'Your Applications' section contains a table with columns for 'Tracking ID', 'Call Name', 'Title', and 'Proposal Status'. A red arrow points from the 'Applications' tab to the 'Current Open Calls' section. Another red arrow points from the 'Create New Application' link in the 'Current Open Calls' section to the 'Your Applications' section. A third red arrow points from the 'Your Applications' section to a text box that says 'Any saved applications will be listed in the "Your Applications" area'. A fourth red arrow points from a text box that says 'Click the "Applications" Tab' to the 'Applications' tab. A fifth red arrow points from a text box that says 'Click "Create New Application"' to the 'Create New Application' link.

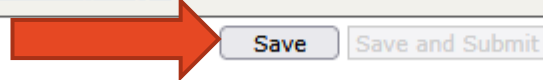
Call Name	End Date	Fiscal Year
Fall 2019 Concept Paper	12/11/2019 1:00:00 AM	2019

Tracking ID	Call Name	Title	Proposal Status
CP-19.2.F-21573	Fall 2019 Concept Paper	Test	Working

Proceed to Application tab to view Current Open Calls. Select "Create New Application". Application form will appear in new window. Directions are displayed for each section.

After completing and saving this form, the applicant may edit the saved version until Wednesday, May 27, 2026 5:00 PM PT. To submit the proposal for final review, the applicant **MUST** click on the "Save and Submit" below. **Forms in the system that are "Saved" but not "Submitted" are considered incomplete and will not be reviewed.**

For assistance please contact Michelle Herawi at 925-423-4964 or hpc4ei-submissions@llnl.gov.



Application must be saved before PI, Co-PIs, Proposal POC, and National Laboratory PIs sections can be populated. Forms may be saved, revisited, and edited until the deadline.

Returning Applicants

Previous Submission Encouraged to Resubmit

Provide information for previous submissions encouraged to resubmit to future solicitation call. Include Tracking ID number if applicant was listed on the applicant.

Yes
 No

TrackingID	Title
▲ Warning: Application must be saved before this field is enabled.	
+ Add	



Follow-On Project

If the proposal is a follow-on, include the project's Full Proposal Tracking ID and project title. A follow-on project is Phase

Project Yes
 No

TrackingID	Title
▲ Warning: Application must be saved before this field is enabled.	
+ Add	

- In the Previous Submission, including proposals encouraged for resubmission, and Follow-On Project sections, applicants can link previous proposal records to the application.
- Previous submissions and project information will appear in the drop-down list if the records are associated with the user.

Add a previous proposal to this proposal. ✕

You can either pick from your proposals in the system or enter the data manually below. i

Existing Proposal: No approved statuses are entered. ▼

TrackingID: * i

Title: *

Description: *

📄 🔍

Upload Submission and Delegate Access to Application

Concept Paper



Before uploading submission, ensure concept paper file is formatted per provided [Spring 2026 Concept Paper Template](#).

Click to download
Concept Paper Template

Instructions:

1. **Remove** all instructional boxes from template.
2. **Cover page:** List only Tracking ID, Project Title, and Company Name.
3. **File name format:** Tracking ID_Company Name *Example: CP-N-26.1-26421_ABC Company*
4. **Submission format:** Single spaced pages using 12-point Times New Roman, 1" margins, and converted to a PDF file.

A concept paper that does not meet the guidelines may be rejected for review.

After completing and saving this form, the applicant may edit the saved version until Wednesday, May 27, 2026 5:00 PM PT. To submit the proposal for final review, the applicant **MUST** click on the "Save and Submit" below. **Forms in the system that are "Saved" but not "Submitted" are considered incomplete and will not be reviewed.**

For assistance please contact Michelle Herawi at 925-423-4964 or hpc4ei-submissions@llnl.gov.



List of applications are displayed on the Applications page. To delegate access to another user in the system, click on the 'add person' icon next to application record. Delegate must have an active system account to be assigned access.

Delegated applications will be displayed in the "Other applications you have been delegated rights to" section.

Delegate Access

Delegate requires an active column. Delegated applications

	Tracking ID	Company Name
	CP-M-24.1-3670	Fa
	CP-L-24.1-3396	Sp
	CP-K-23.1-3201	St
	FP-J-22.2-2996	Fa
	CP-J-22.1-2996	Fa
	FP-I-22.2-2744	Sp
	CP-I-22.1-2858	Sp
	FP-H-21.2-2744	Fa
	CP-H-21.1-2744	Fa
	FP-G-21.2-2643	Sp

Delegated Rights

Tracking ID: CP-M-24.1-36701
Title:

First Name	Middle Name	Last Name	Email	Permission Level
None				

Page: 1 of 1 Go Page size: 1 Change Item 0 to 0 of 0

Enter a possible delegate for the proposal. You are only able to add a delegate of a user that is already in the system. Accounts are identified by email address. Make sure that you know the email address the delegate has registered with the system. If you are adding a user that does not have an account in the system, they will need to create/register for an account before you will be able to add them as a delegate.

+ Create New Request

Email:

Proposal Admin

Check Application Status

Home Applications **Reviews** Reports My Information Admin Feedback

Current Open Calls

Call Name
Fall 2019 Concept Paper

Your Applications

Tracking ID	Call Name	Title	Proposal Status
CP-19.2.F-21573	Fall 2019 Concept Paper	Test	Working

Page: 1 of 1 Go Page size: 1 Change

Visit the Applications page to view proposal status and Technical Merit Review Committee comments.

Notifications of review results are generated by the proposal system and sent from hpc4ei-submissions@inl.gov. We highly recommend adding this email address to your contact list to help prevent these notifications from being routed to spam.

Tracking ID	Call Name	Title	Proposal Status	Delegated Rights	Reviewer Comments
CP-D-20.1-23563	Winter 2020 Concept Paper		Working		
FP-C-19.2-21573	Fall 2019 Full Proposal	Test	Working	Proposal Admin -	
CP-C-19.2-21573	Fall 2019 Concept Paper	Test	Submitted		See Comments

Page: 1 of 1 Go Page size: 3 Change Item 1 to 3 of 3

Visit HPC4EI website for solicitation details

**Concept Paper Deadline
May 27, 2026 by 5:00 p.m. PT**

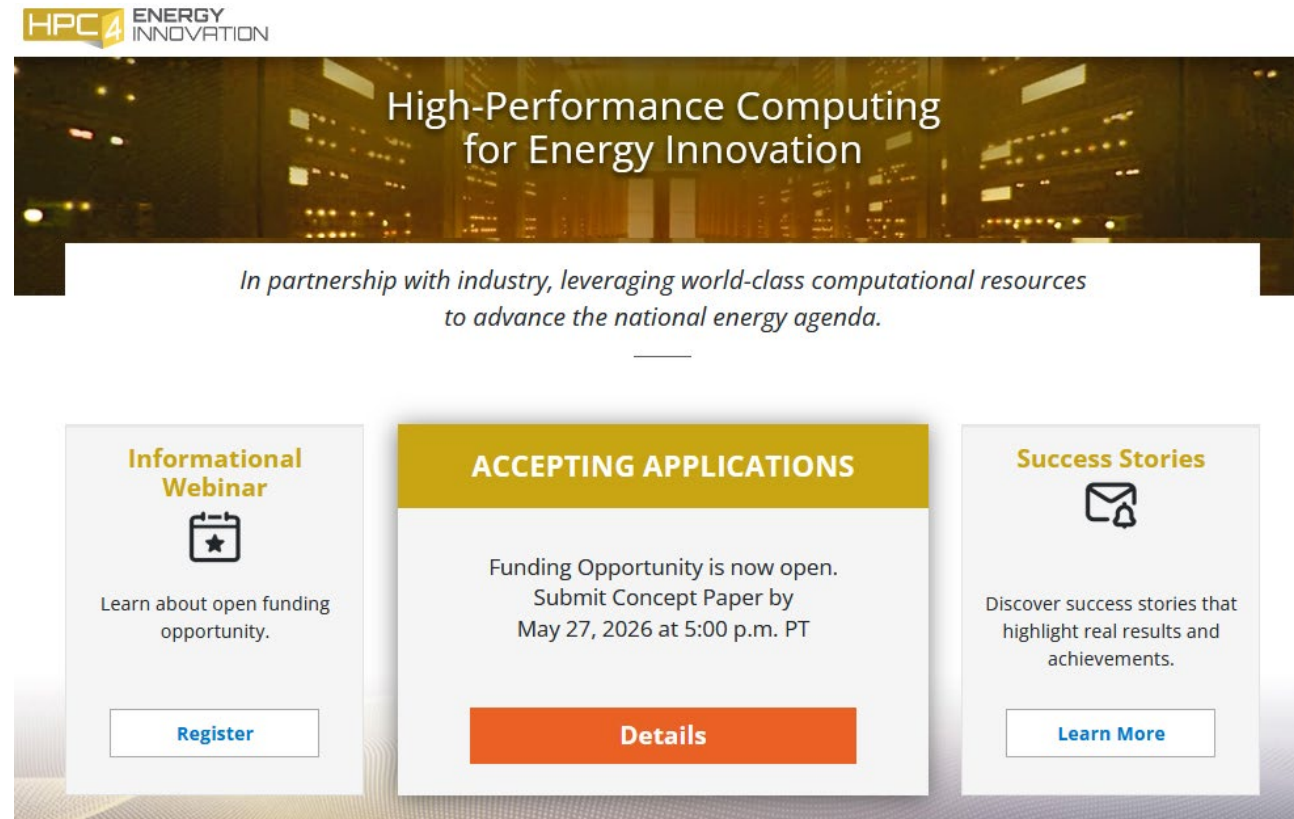
www.hpc4energyinnovation.org

Aaron Fisher, HPC4EI Director
fisher47@llnl.gov

Send questions to hpc4ei@llnl.gov

Be the first to receive program announcements by joining the hpc4ei-info@llnl.gov distribution list. Subscribe on our website!

Proposal Application Portal
<https://proposalshpc4.inl.gov>



The screenshot shows the HPC4EI website homepage. At the top left is the HPC4 ENERGY INNOVATION logo. The main header features a night cityscape background with the text "High-Performance Computing for Energy Innovation". Below this is a quote: "In partnership with industry, leveraging world-class computational resources to advance the national energy agenda." The page is divided into three columns. The first column is titled "Informational Webinar" and includes a calendar icon, the text "Learn about open funding opportunity.", and a "Register" button. The second column is titled "ACCEPTING APPLICATIONS" and includes the text "Funding Opportunity is now open. Submit Concept Paper by May 27, 2026 at 5:00 p.m. PT" and a "Details" button. The third column is titled "Success Stories" and includes an envelope icon, the text "Discover success stories that highlight real results and achievements.", and a "Learn More" button.