

Energy Frontiers: Research at CAES

“You can’t solve a problem on the same level that it was created. You have to rise above it to the next level” – Albert Einstein

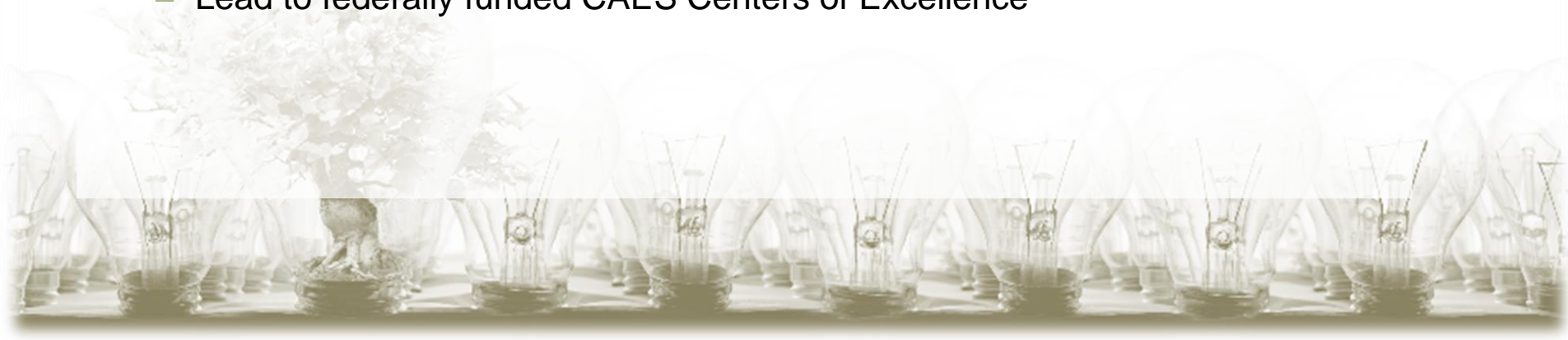
October 2020

A COLLABORATION BETWEEN



The Future of Energy...

- Is fraught with complexities that cross traditional scientific, policy, and societal boundaries.
- Requires investment in emerging frontiers to ensure adequate resources enable CAES Centers of Excellence to solve the most pressing energy issues of our time.
- **Will be formed by CAES Energy Frontiers. Meeting these challenges will:**
 - Expand our collaborative reach
 - Further our educational mission through research
 - Result in energy innovations with global impact
 - Create transdisciplinary teams to advance the energy field through holistic methods and approaches
 - Lead to federally funded CAES Centers of Excellence



Energy Frontiers

Leading at this Energy Frontier will require a convergence of research at the nexus of these subtopics and more.

Resilient Critical Materials Economy

- Identify new materials to replace critical minerals
- New sources of rare-earth elements
- Human factors
- Advanced separations methods and materials

CAES Leadership is looking for a team of innovators to take a global leadership position in addressing the supply of rare earth elements and platinum group metals.

Potential Focus Areas
EWN, AM, IES, EP, CDV



The future of the human-technology frontier depends upon a resilient supply chain of platinum group metals and rare earth elements.

We challenge CAES to accelerate the socio-technological revolution by creating an integrated scientific, economic, and policy ecosystem which ensures a resilient supply, and ultimately replacement of critical materials.

Energy Frontiers

Leading at this Energy Frontier will require a convergence of research at the nexus of these subtopics and more.

Accelerating Energy Transitions

- Clean water
- Policy
- CCUS
- Cybersecurity
- IoT sensors
- Hydrogen economy
- SMRs/Microreactors

CAES Leadership is looking for a team of innovators to take a global leadership position in accelerating transitions to integrated energy systems.

Potential Focus Areas

EWN, AM, IES, EP, Nuclear, Cyber, CDV



Accelerating Energy Transitions advances the development of resilient energy systems with minimal environmental impact.

We challenge CAES to accelerate innovations in renewable energy, nuclear energy, and carbon sequestration systems to expedite the development of integrated energy systems, policies, and economies.

Energy Frontiers

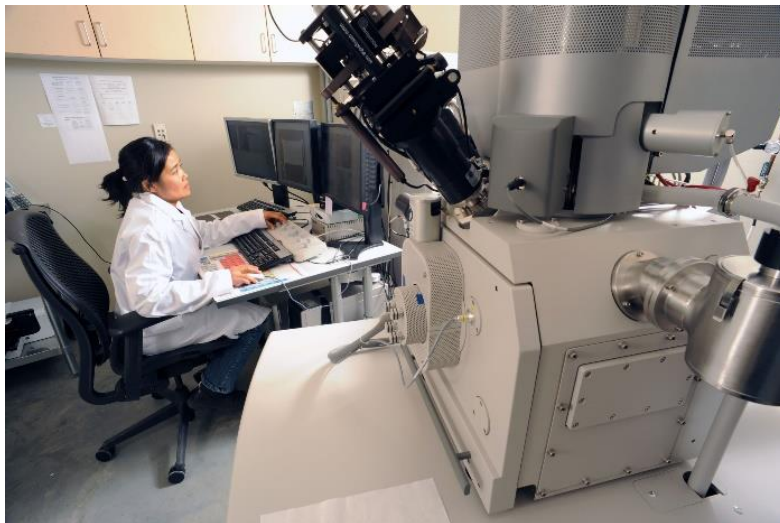
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Advanced Manufacturing for Extreme Environments

- Intelligent design and fabrication
- Supply chain security and resilience
- Scaling of exotic alloys and materials
- In situ beamline experiments
- Molten Salts
- SMRs/Microreactors
- The new middle class – policy, education, and technology

CAES Leadership is looking for a team of innovators to take a global leadership position in transforming the U.S. manufacturing economy.

Potential Focus Areas
AM, EP, Cyber, CDV, Nuclear



Advance Manufacturing for Extreme Environments aims to discover new fundamental knowledge at the nexus of artificial intelligence, cybersecurity, and advanced manufacturing.

We challenge CAES to lead discovery at the frontier of advanced manufacturing and create a new model for the manufacturing economy of the nation.

Getting Buy-In for Energy Frontiers

How will we build a team to establish center level activity in identified Energy Frontiers?

Step 1

- The CAES Executive Board will agree upon 3 targeted Energy Frontiers and hold an open house to solicit feedback from the CAES Community.
- Feedback will be synthesized to inform our potential Energy Frontier Challenges for further potential revision and advancing to Step 2.

Step 2

- CAES will compete the Energy Frontier themes to identify a Task Force for investment in support of a Center level internal proposal in that theme.

Step 3

- Internal proposals will be reviewed by CAES Executive Board for modification/down selection.
- Results will be presented to Steering Committee for review and investment.



Investments and Incentives

- **Center level proposals require significant planning and investment.**
- **Proposals are typically led by highly respected leaders and researchers over a 1- to 2-year timeframe.**
- **Potential areas for investment include:**
 - Course buyout for the lead PI for a minimum of one semester during which the proposal is due. (Universities)
 - Summer salary for key task force members. (Shared)
 - Seed research funds and/or student support (Universities)
 - Travel support (INL)
 - Dedicated grant writer/strategist support (Shared)
 - Access to graphic design services (INL, Shared)
 - Grant review from contracted firms (e.g. TIG) (Shared)
 - Roundtable / workshops (INL)



Logistics

Website or online portal to collect comments and proposals

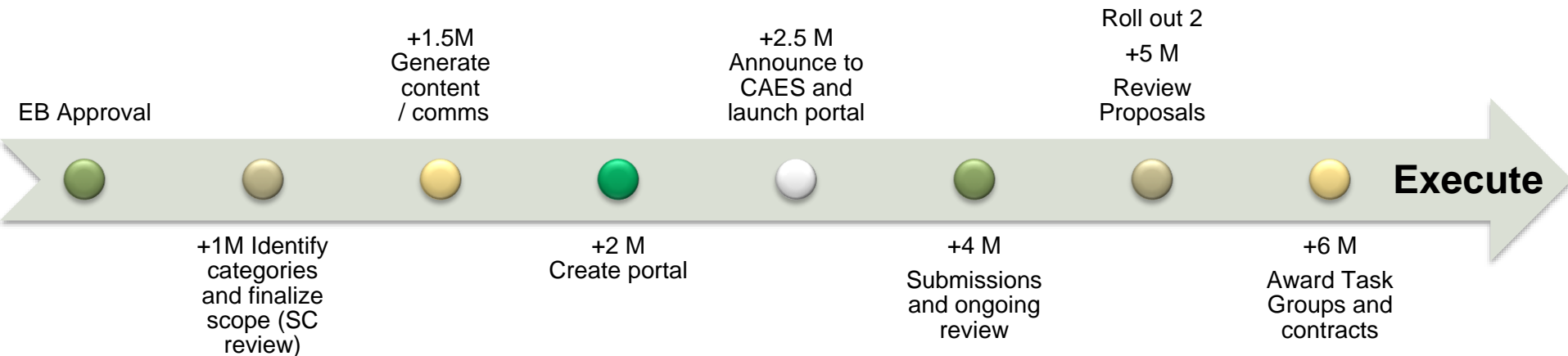
- A website will be made available with full details of proposal requirements.
- Proposals submitted via email and compiled by CAES staff.
- Executive Board and Steering Committee will review proposals for potential investment.

Task Force Proposals will likely include elements such as:

- Brief description of targeted center (e.g. NSF ERC LOI to include vision & mission)
- Proposed research and why it is nationally competitive
- Potential task force participants (individuals leading the effort, must include a minimum of three CAES institutions)
- Current research and funding supporting the proposed theme
- Publication record of task force participants (highlight co-authored papers)
- Targeted funding opportunity announcement
- Potential partners including universities, industry, NGOs, and FFRDCs
- Unique capabilities and infrastructure (current and future)
- Lead PI's CV



Proposed Timeline



Roll out Part 1

Key activities include:

- Announcement to CAES community
- Open house and all hands
- Online Portal
- Menu update
- Optional teaming at Winter SKI Event or WG events

Roll out Part 2

Key activities include:

- Review of submissions
- Resource identification
- Resource opportunity announcement to support implementation
- Contracting

Collaboration Inspiring Innovation and Impact

CAES

**Center for Advanced
Energy Studies**



CAES Center for Advanced
Energy Studies