



U.S. DEPARTMENT
of **ENERGY**

Office of Critical Minerals
and Energy Innovation

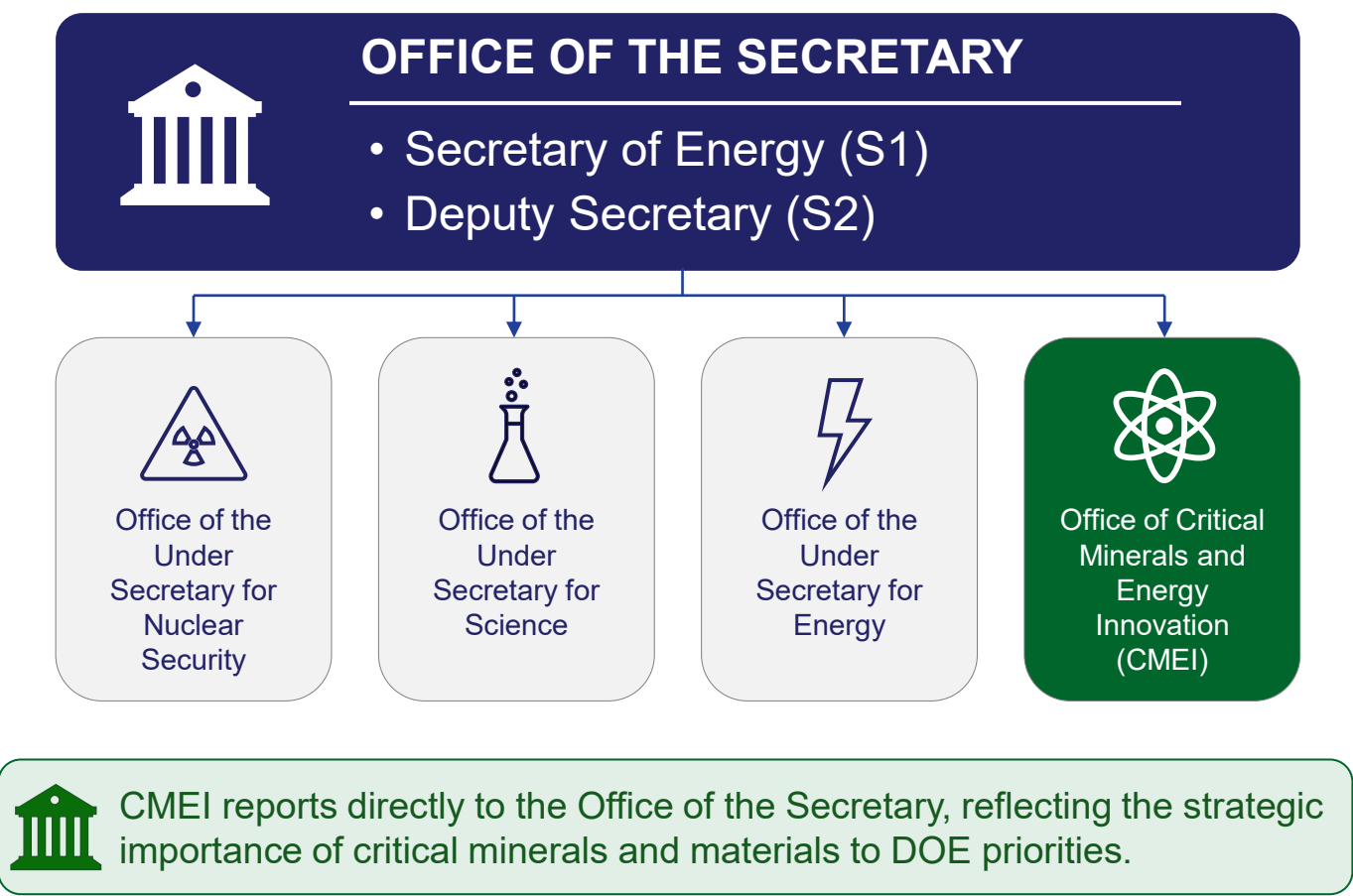
Materials & Manufacturing: The Federal Landscape - Department of Energy

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Office of Critical Minerals and Energy Innovation (CMEI)

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Office of Critical Minerals and Energy Innovation





CMEI Mission

Advancing America's critical minerals supply chains and accelerating next generation energy technologies to strengthen our nation's energy security and power our future.

CMEI Aims to:



ENABLE the American mineral, mining, and extractive industries to return to dominance and ensure a stable U.S. mineral/metal supply chain.



LEAD the world in metals, mining, materials science, magnets, batteries, and innovation.



DRIVE growth, efficiency, and innovation in U.S.-based manufacturing and the workforce-education programs.



STEWARD federal resources to reduce the cost of energy for everyday Americans.



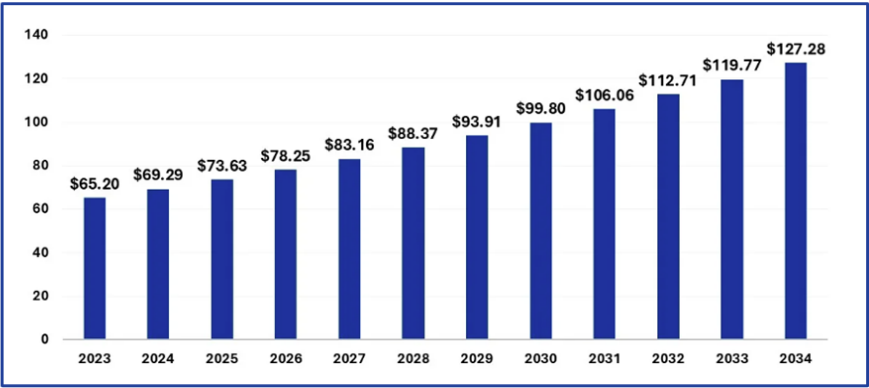
DEVELOP the systems and research needed for nationwide standards, certifications and validations.



MAINTAIN U.S. leadership in next generation energy systems, vehicle technologies, fuels, chemicals, and materials.

Advanced Materials: The Foundation of American Energy Dominance

Advanced Materials Market Size (\$B):



Materials Innovation For Next-Generation Energy

Advanced materials deliver broad **economic** and **societal** benefits through reducing energy **costs**, enabling energy system reliability, and securing the nation's **energy independence**.

Strategic Value of Advanced Materials for US Energy

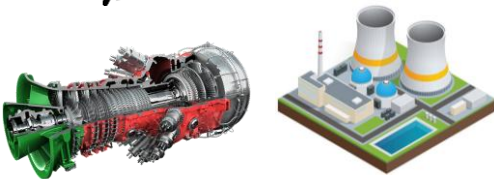
Advanced materials enable:

- System Affordability
- Reliability and Resilience
- Energy Abundance

Benefits from Advanced Materials Innovations - Transformational



Power Generation



High entropy alloys withstand exposure to >1000°C and radiative environments for >10,000 hours, while maintaining strength



Energy Storage



Solid state electrolytes provide up to 2x energy density, better thermal stability, lower risk of thermal runaway



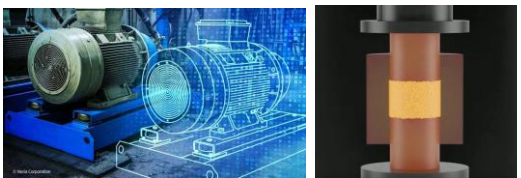
Grid/Transmission



High conductivity copper alloys enable 30% lower resistive losses and withstand higher operating temperatures



Efficient Manufacturing



Digitally optimized processing achieves 50% reduction in embodied energy and 90% reduction in waste

Advanced Materials: Goal and Innovation Levers

GOAL: Accelerate Development and Deployment of New Materials for Energy Production Systems

- **Integrated Modeling and Data-Driven Design:** New AI-enabled materials design frameworks to co-develop material structure and processing flowsheets to meet elevated performance targets for high temperature and other harsh conditions
- **Advanced Synthesis and Characterization:** Develop new methods to rapidly synthesize, test and characterize new materials in a rapid framework using high throughput, autonomous materials processing. Develop new materials standards pathways for rapid materials qualification.
- **Scaling for Manufacturing Readiness:** Develop new system-level modeling approaches to develop materials for scale manufacturing and reduce time to market



Geothermal



Hydropower



Nuclear



Fossil



Conductors

Advanced
Materials



Advanced Materials: Portfolio Accomplishments (HEM)

NUCLEAR

General Atomics I:

\$2M (Fed)

-SiGA-P³ will ultimately reduce CMC manufacturing energy consumption for nuclear applications by 70%



Figure 1. Spool and electron microscope image of GA-EMS produced 2.9 GPa SiC fiber

General Atomics II:\$2M

-Reduce waste by 20% and energy use by 70% for SiC CMC manufacturing

INDUSTRIAL/AEROSPACE

Edison Welding Institute: \$4M

-Reduce jet turbine hot gas path part manufacturing costs by 10-20%
-Improve durability of γ'-strengthened Ni super alloys by 20-30%

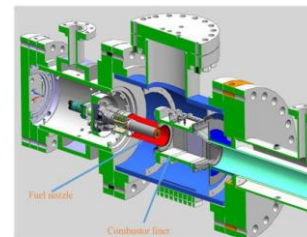
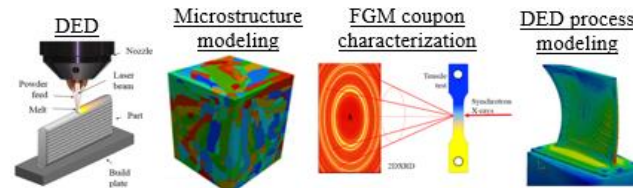


Figure 2. A high-pressure combustion test setup at GER

GEO THERMAL

Argonne National Lab:\$2M

-Improve drilling component lifespan by 20% via ultra-fast boring process and a cladding/coating of high-entropy alloys



Fig. 2. a) wire-powder dual feed LDED capable of large area manufacturing of tailored alloys, b) Chemical composition & hardness profile of a functionally graded alloy (FGA) produced using the simultaneous wire-powder feed LDED process. GRCOP 42 powder & Inconel 625 wire deposited form a bimetallic Ni/Cu

FOSSIL

University of Southern California: \$2M

-Utilize machine learning to develop a thermal barrier coating for H₂ and blended gas turbine engines applied via plasma spraying

West Virginia University: \$2M

-Develop high-entropy aluminum alloys to serve as both a protective and bond coat for the thermal barrier coating in hydrogen and blended gas combustion turbines

POWER PIPING (NUCLEAR/FOSSIL)

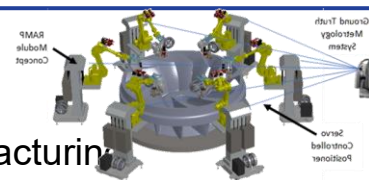
Electronic Power Research Institute:\$1.7M

-Demonstrate fluid transport part fabrication for nuclear systems with additively manufactured oxide dispersed strengthened (ODS) stainless steel components (e.g., valves), delivering production cost reductions of up to 50%

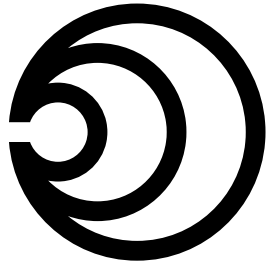
HYDROELECTRIC/MANUFACTURING

ORNL: \$15M

-Develop domestic large near net shape part manufacturing capabilities for hydropower, shortening lead time by 50%



2025 Executive Order Launches Genesis Mission



Genesis Mission

- Whitehouse EO tasks DOE with creating an AI platform uniting the computing resources of the National Labs.
- **Genesis Goal:** Double productivity and pace of R&D in a decade.

National Challenges – Materials and MFG

- **Achieving AI-Driven Autonomous Laboratories**
 - Science Discovery
- **Accelerating Materials Discovery, Production, and Qualification for Strategic Deterrence**
 - Nuclear Security
- **Designing Materials with Predictable Functionality**
 - Using AI to design materials based on performance goals, shrinking development timelines from decades to months.
- **Securing America's Critical Minerals Supply**
- **Reenvisioning Advanced Manufacturing and Industrial Productivity**

Current Open Funding Opportunities

Materials-related solicitations across the U.S. Department of Energy — as of October 2026

1 Office of Science FY2027 Open Call (DE-FOA-0003665)

Up to \$400M for basic research across BES, Fusion, Nuclear Physics & more; materials & critical materials are BES priorities — open through Sep 30, 2027.

science.osti.gov/grants/FOAs/Open

2 Quantum Genesis Q Competition (DE-FOA-0003657, Office of Science)

Up to \$215M planned to accelerate a fault-tolerant quantum computer — applications due Oct 19, 2026.

science.osti.gov/grants/FOAs/Open

3 ASPECT (DE-FOA-0003647, CMEI)

\$58M to scale up chemical technologies from alternative & waste feedstocks — concept papers due Oct 9, 2026.

[eere-exchange.energy.gov \(ASPECT NOFO\)](https://eere-exchange.energy.gov/ASPECT%20NOFO)

4 PROSPECT Planning Prize (CMEI)

\$16M prize pool (up to \$1M per winner) for universities building the mining & critical minerals workforce — submissions due Oct 5, 2026.

energy.gov/cmei — [PROSPECT Planning Prize](#)

5 CLIMR Lab Call (Office of Technology Commercialization)

Up to \$41M to commercialize national-lab energy technologies with industry partners — lab concept papers due Nov 3, 2026.

energy.gov — [\\$41M CLIMR lab call](#)

6 Genesis Mission (DE-FOA-0003612, Office of Science)

AI for science & energy — Phase II applications close Dec 17, 2026.

science.osti.gov/grants/FOAs/Open

7 ITAC — Industrial Training & Assessment Centers (CMEI)

Five-year recompetes for university-based assessment centers; Track 1 manufacturing + new Track 2 mining & mineral processing — applications due Oct 30, 2026.

energy.gov/cmei — [ITAC applications](#)

Thank You

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