FEDERAL OPPORTUNITIES IN CLIMATE AND CLEAN ENERGY

Lewis-Burke Associates
January 2023
AGENDA

1. Climate and Clean Energy Investments
   a. Department of Energy
   b. National Science Foundation
   c. Department of Transportation
   d. Department of Defense
   e. Department of Commerce
   f. USDA

2. Climate and Environmental Health
   a. Environmental Protection Agency
   b. National Institutes of Health
   c. Agency for Healthcare Research and Quality
FY 2023 Appropriations for Select Federal Agencies ($ in billions)

- **NIH**: $45 billion, +8% increase
- **DOE**: $45 billion, +3% increase
- **NASA**: $25 billion, +6% increase
- **DOD S&T**: $20 billion, +19% increase
- **NSF**: $10 billion, +8% increase

Legend:
- **FY 2023 Omnibus**
- **FY 2022 Enacted**
FY 2023 includes supplemental funding, to support programs authorized but not funded in the *CHIPS and Science Act*

**FY 2023 APPROPRIATIONS AND SUPPLEMENTAL FUNDING**  
($ IN MILLIONS)

<table>
<thead>
<tr>
<th>Program</th>
<th>FY 2023 Appropriations</th>
<th>Supplemental Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIST/Manufacturing USA</td>
<td>$37</td>
<td>$14</td>
</tr>
<tr>
<td>NIST/Manufacturing Extension...</td>
<td>$175</td>
<td>$13</td>
</tr>
<tr>
<td>EDA/Regional Tech Hubs</td>
<td>$41</td>
<td>$459</td>
</tr>
<tr>
<td>NSF</td>
<td>$9,539</td>
<td>$335</td>
</tr>
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</table>
MAJOR FEDERAL CLIMATE AND CLEAN ENERGY OPPORTUNITIES IN THE NEXT SIX MONTHS

1. DOE Energy Earthshot Research Centers
2. DOE Energy Earthshot Innovative Research
3. DOE Battery and Energy Storage Innovation Hubs
4. DOE Accelerate Innovations in Emerging Technologies Centers
5. DOE Computational Materials Sciences Centers
6. NSF Regional Climate Impact Integration Hubs
7. NSF AI Institutes with Climate Focus
8. Transportation Resilience and Adaption Centers of Excellence
9. USDA Greenhouse Gas Monitoring Program
FY 2023 DOE FUNDING

$143 Billion

- Bipartisan Infrastructure Act: $46B
- Inflation Reduction Act: $35B
- FY 2023 Appropriations: $62B
FY 2023 DOE FUNDING BY CATEGORY

FY 2023 Funding for DOE Activities
($ in millions)

Clean Energy Demonstrations: $20
Applied Energy R&D: $6,593 (+4%)
Office of Science: $7,475 + $8,100 (+8%)

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FY 2023 Funding for Cross-Cutting R&D Initiatives
($ in millions)

- Industrial Decarbonization: $685
- Energy Storage: $540
- Alternative Fuels*: $380
- Hydrogen: $316
- Quantum Information Science: $245
- Critical Minerals: $249
- Carbon Dioxide Removal: $140
- Artificial Intelligence: $135

Compared to FY 2022 Appropriations:
- Industrial Decarbonization: Increase by $205 million
- Energy Storage: Increase by $30 million
- Alternative Fuels*: Increase by $120 million
- Hydrogen: Increase by $44 million
- Quantum Information Science: Increase by $14 million
- Critical Minerals: Increase by $2 million
- Carbon Dioxide Removal: Increase by $0 million
- Artificial Intelligence: Increase by $0 million

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OFFICE OF SCIENCE FUNDING

FY 2023 Office of Science Funding

- ASCR: +3%
- BES: +10%
- BER: +12%
- FES: +7%
- HEP: +8%
- NP: +11%

Legend:
- # FY 2022 Enacted
- # FY 2023 Appropriations
FY 2023 - FY 2024 RESEARCH OPPORTUNITIES

1. Energy Earthshot Research Centers – Pre-proposals due April 11
2. Energy Earthshot Innovative Research – February 2023
3. Battery and Energy Storage Innovation Hub – Pre-applications due April 3
4. Accelerate Innovations in Emerging Technologies – April 2023
5. Computational Materials Sciences Centers – February 2023
6. Energy Frontier Research Centers – November 2023
7. Urban Integrated Field Labs – January 2024 (Pushed to FY 2024)
ENERGY EARTHSHOTS

- Hydrogen
  - 1 Dollar
  - 1 Kilogram
  - 1 Decade

- Storage™
  - 90%
  - 10+ Hours
  - 1 Decade

- Carbon Negative™
  - <100 Dollars
  - 1 Ton
  - 1 Decade

- Enhanced Geothermal™
  - 90% Reduction
  - 2035

- Industrial Heat™
  - 85% Reduction
  - 2035

- Floating Offshore Wind
  - >70% Reduction
  - 2035
ENERGY EARTHSHTO RESEARCH CENTERS (EERCS)—$50 MILLION (FOA RELEASED JANUARY 18, PRE-PROPOSALS DUE APRIL 11)

- Up to 16 new multi-investigator, multi-disciplinary Centers.
- National lab led with research university, non-profit and industry partners.
- $3 million to $5 million per year for each center over four years.
- The purpose would be to address research challenges of the six existing Energy Earthshots.
  - Teams would focus on energy-relevant research with a scope and complexity beyond what is possible in standard single investigator or small group awards.
  - The EERCs are intended to address research challenges at the interface of basic applied research with a lot of input and direction from the applied energy office and hence more attention to translational science.
- Unlike Energy Frontier Research Centers (EFRCs), the EERCs would be jointly funded managed by three Office of Science programs—Basic Energy Sciences (BES), Advanced Scientific Computing Research (ASCR) and the Biological and Environmental Research (BER) program, in addition to close coordination with the DOE applied energy offices.
- The EERCs would also cover a much broader scope of scientific disciplines and activities than EFRCs, which are primarily focused on materials and chemistry research.
- Strong emphasis on the use of innovative high-performance and scientific-computing techniques.
EERCs will be complemented by single Principal Investigator and small group awards focused on use-inspired fundamental research to address knowledge gaps that limit achievement of the Energy Earthshot goals.

Examples of research priorities to support Energy Earthshots:

➢ Advance foundational knowledge and state-of-the-art capabilities in experimental, theoretical, and computational sciences, such as applied math and computer science solutions that focus on incorporating Artificial Intelligence and machine learning in use-inspired fundamental research.

➢ New materials, chemistries, and components.

➢ Multiscale computational and modeling tools with new artificial intelligence and machine learning technologies.

➢ Real-time characterization including in extreme environments.

➢ Carbon dioxide removal using soil carbon sequestration practices, including crops that increase the amount of carbon stored in the soil.
On January 26, DOE issued funding solicitation to openly recompete the current Batteries and Energy Storage Hub led by Argonne National Laboratory, the Joint Center for Energy Storage Research (JCESR), which is in its 10th and final year of award. DOE plans to fund up to three new Hubs ranging from $10 million to $15 million per year over five years. The focus will continue to be on early-stage research for next generation electrical energy storage for the grid and vehicles, especially electrochemistry.

- Basic Research Needs report for Next Generation Electrical Energy Storage will guide priority research directions
- Interest in growing participation of energy storage industry partners in research, advisory panels, and tech transfer and commercialization activities
- Workforce development a top priority, including participation of underrepresented groups and Minority Serving Institutions
• DOE plans to fund highly integrated research teams to accelerate the discovery, creation, production, and commercialization of new emerging technologies.
  ➢ Funding would be focused on 10 key technologies areas.
  ➢ The goal would be to couple basic science in chemistry, computation, biology, materials, physics, and engineering to form teams of scientists and engineers from universities, national laboratories and industry.
  ➢ Teams would combine key technologies with more than one emerging technology area (e.g., advanced manufacturing with Artificial Intelligence) to accelerate innovation.
  ➢ Teams would integrate industrial partners to define novel mechanisms to support the science and technology goals and ensure viable pathways along the innovation continuum for commercialization.
  ➢ Teams would also include local, regionally-based partnerships to catalyze start-ups.
  ➢ To help train a STEM workforce, the teams should include internships and other opportunities for students to get hands on training and serve as a focal point for entrepreneurship.
• DOE is recompeting computational materials science center awards made in FY 2019.
• Awards are $4 million per year over four years.
• This program supports integrated, multidisciplinary teams to perform research and develop open-source codes and databases for predictive design of functional materials.
  ➢ The focus is on new approaches to enhance the use of large data sets derived from advanced characterization of materials, materials synthesis, processing, properties assessments, and the data generated by large-scale computational efforts that model materials phenomena.
  ➢ Teams are expected to develop open-source, robust, validated, user-friendly software (and the associated experimental and computational databases) that captures the essential physics and chemistry of relevant systems and can be used by the broader research community and by industry to accelerate the design of new functional materials.
FY 2024 competition will have fewer topic areas, more focused, and smaller funding amount than more open FY 2022 solicitation.

10 centers up for renewal or recompetition.

Multi-investigator, multi-disciplinary, multi-institutional centers to accelerate scientific discovery and tackle transformative energy grand challenges in materials sciences, chemical sciences, geosciences, and biosciences.

Each center is funded between $2 million and $4 million per year over four years.

Source: DOE Office of Science.
URBAN INTEGRATED FIELD LABS – $25 MILLION (JANUARY 2024)

- DOE plans to release a second solicitation in FY 2024 to fund additional urban integrated field labs beyond those that were awarded in FY 2022.
  - The focus would still be on regionally diverse urban field laboratories that would build integrated models and tools that improve understanding of the interdependence of the natural and human components of the climate system.
  - The goal would be to tackle three specific interdependent challenges:
    - constraining climate change and its impacts on all scales across urban regions;
    - evaluating the mitigation-potential for emerging energy technologies in urban regions and beyond; and
    - addressing environmental justice through neighborhood scale evaluation of climate impacts and energy needs.
  - Awards for these field labs would likely range from $2 million to $5 million a year over five years.
  - The FY 2024 funding solicitation is expected to be similar to the FY 2022 funding solicitation available [here](#).
FY 2023 Priorities:

- **Energy-related topics:**
  - Grid resilience, reliability, flexibility, and operation;
  - advanced nuclear or fusion technologies;
  - disruptive storage for transportation and/or grid;
  - carbon neutral or negative fuels; and
  - decarbonization and/or greenhouse gas (GHG) capture.

- **Climate-related topics:**
  - Climate sensors and monitoring for dramatically improved GHG detection, climate analysis, and severe event prediction;
  - carbon neutral/negative agricultural production and general land, freshwater, and ocean use;
  - prevention of GHG emissions from land sources;
  - carbon neutral waste and recycling; and
  - resilient infrastructure to protect against climate-related severe events.

- **Planned Funding Calls over the next six months:**
  - **Reactive carbon capture**: fuel synthesis, carbon capture, and process engineering technologies to convert diffuse or point-source CO2 to high value chemical intermediates and/or fuel products.
  - **Marine carbon sensing**: new technologies to measure and verify ocean carbon dioxide removal.
  - **Carbon farming**: approaches to terrestrial ecosystems and bioeconomy supply chains for carbon dioxide removal, management and sequestration.
  - **Undergrounding distribution power lines**
  - **Ultra-fast triggered devices**: next-generation ultra-fast semiconductor devices for enhanced resiliency and reliability of power electronics systems ranging from kilowatts to gigawatts of power.
FOSSIL ENERGY AND CARBON MANAGEMENT R&D PRIORITIES

RDD&D Priorities

Demonstrate and Deploy Point Source Carbon Capture
RDD&D for CCS in the power and industrial sectors to enable wider, strategic commercial deployment to meet net-zero emissions goals by 2050.

Advance Carbon Dioxide Removal & Low Carbon Supply Chains for Industry
Air capture and mineral carbonation projects and develop novel approaches to recycle carbon emissions.

Low-Carbon Industrial Supply Chains
Develop novel approaches to recycle carbon emissions into value-added products such as concrete, steel, chemicals, and fuels using systems-based carbon management approaches consistent with realizing a net-zero carbon economy by 2050.

Accelerate Carbon-Neutral Hydrogen (H₂)
Develop technologies that leverage the natural gas infrastructure for H₂ production, transport, storage, & use, coupled to carbon management.

Reduce Methane Emissions
Develop technologies and deploy regional initiatives to monitor and reduce methane emissions from fossil fuel infrastructure including coal, oil, and gas.

Advance Critical Minerals, Rare Earth Elements (REE), and Mine Remediation
Improving REE separation/recycling technologies to manufacture products from CO₂ and carbon ores and to address current market and process economics. Advancing R&D to address abandoned mines.

Increase Efficient Use of Big Data and Artificial Intelligence
Use AI, machine learning, and data analysis to create learning algorithms within a large dataset to help discover new materials, optimize processes, and run autonomous systems.

Address the Energy Water Nexus
Improve our efficient use of scarce water resources and advance water remediation technologies to address the environmental impacts related to produced or displaced water associated with oil, gas, and coal industries, in addition to that associated with dedicated CO₂ storage.

Invest in Thoughtful Transition Strategies
Invest in technologies and approaches and deploy regional initiatives to help create an equitable and just transition to a net-zero carbon economy in energy communities.

Source: DOE.
BIL/IJAVA DEPARTMENT OF ENERGY FUNDING—$62 BILLION OVER FIVE YEARS (FY 2022-2026)

- Clean Energy Demonstrations: $21.5
- Grid Infrastructure Resilience and Reliability: $16.5
- Supply Chain Manufacturing: $7.8
- Maintaining Current Generation Fleet: $6.7
- State Programs: $5.1
- Research and Development: $4.4
DEPARTMENT OF ENERGY FUNDING—$62 BILLION OVER FIVE YEARS (FY 2022-2026)

DOE Clean Energy Infrastructure Funding ($ in billions)

- Funding Awarded: $29.0
- Funding Opportunity Released: $10.0
- Funding Remaining: $23.0
### DOE Clean Energy Demonstration Project Funding Opportunities of Most Relevance to Institutions of Higher Education

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Funding Amount</th>
<th>Status and Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery Manufacturing and Recycling for Electric Vehicles and Grid</td>
<td>$2.8 Billion</td>
<td>CLOSED</td>
</tr>
<tr>
<td>Solar and Wind Grid Services and Reliability Demonstration</td>
<td>$26 million</td>
<td>CLOSED</td>
</tr>
<tr>
<td>Regional Clean Hydrogen Hubs</td>
<td>$7 Billion with $1 Billion to be released in future years</td>
<td>CLOSED</td>
</tr>
<tr>
<td>Critical Minerals Refinery Based At U.S. Academic Institution</td>
<td>$156 Million</td>
<td>CLOSED</td>
</tr>
<tr>
<td>CarbonSAFE Initiative—Phases III, III.5, and IV</td>
<td>$2.25 Billion</td>
<td>CLOSED</td>
</tr>
<tr>
<td>Carbon Capture Demonstration Projects Program</td>
<td>$2.54 billion</td>
<td>CLOSED</td>
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<tbody>
<tr>
<td>Carbon Dioxide Transport/FEED Program</td>
<td>$100 million</td>
<td>CLOSED</td>
</tr>
<tr>
<td>FoA released September 22, 2022; Applications were due November 28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydropower Research, Development, and Demonstration Program</td>
<td>$28.5 Million</td>
<td>CLOSED</td>
</tr>
<tr>
<td>FoA released October 21</td>
<td></td>
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<tr>
<td>• Innovative technologies Concept Paper was due December 1</td>
<td></td>
<td></td>
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<tr>
<td>• Pumped Storage Studies Letter of Intent was due November 17</td>
<td></td>
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<tr>
<td>• Stakeholder Engagement Applications were due November 18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-Duration Demonstration Initiative</td>
<td>$350 Million</td>
<td>CLOSED</td>
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<tr>
<td>FoA released November 15 with Letters of Intent due December 15</td>
<td></td>
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</tr>
<tr>
<td>Electric Grid Innovative Resilience Grants</td>
<td>$5 Billion</td>
<td>CLOSED</td>
</tr>
<tr>
<td>FoA released November 16 with concept papers due December 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Grid Grants for Deployment of Technologies to Enhance Grid Flexibility</td>
<td>$3 Billion</td>
<td>CLOSED</td>
</tr>
<tr>
<td>FoA released November 18 with concept papers due December 16</td>
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</tbody>
</table>
## CLEAN ENERGY DEMONSTRATION PROJECT FUNDING OPPORTUNITIES

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Funding Amount</th>
<th>Status and Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive Program for Utilities and Industry For Preventing Outages and Enhancing the Resilience of the Electric Grid</td>
<td>$2.5 Billion</td>
<td><strong>CLOSED</strong></td>
</tr>
<tr>
<td>Reduction of Barriers to Offshore, Land-Based, and Distributed Wind Deployment</td>
<td>$28 million</td>
<td><strong>FOA</strong> released December 6 with concept papers due January 20</td>
</tr>
<tr>
<td>Regional Direct Air Capture Hubs</td>
<td>$3.5 Billion</td>
<td><strong>FOA</strong> released December 13, 2022 with Letters of Intent due March 13</td>
</tr>
<tr>
<td>Formula Grants For Preventing Outages and Enhancing the Resilience of the Electric Grid</td>
<td>$2.3 Billion</td>
<td>First $459 million made available July 6 and <a href="#">applications</a> due March 31, 2023</td>
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<tr>
<td>Enhanced Geothermal Demonstration Projects</td>
<td>$84 Million</td>
<td><strong>RFI</strong> responses were due May 13; FOA expected January/February 2023</td>
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<tr>
<td>Energy Storage Pilot Grant Program</td>
<td>$155 Million</td>
<td><strong>RFI</strong> responses were due June 16, 2022; FOA expected September 2023</td>
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</table>
## Clean Energy Demonstration Project Funding Opportunities

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<thead>
<tr>
<th>Program Name</th>
<th>Funding Amount</th>
<th>Status and Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Hydrogen Electrolysis Program</td>
<td>$1 Billion</td>
<td>FOA expected January 2023</td>
</tr>
<tr>
<td>Solar Improvement Research and Development</td>
<td>$40 Million</td>
<td>FOA expected early 2023</td>
</tr>
<tr>
<td>University Building, Training, and Assessment Centers</td>
<td>$10 Million</td>
<td>FOA expected February 2023</td>
</tr>
<tr>
<td>Tidal or River Current RD&amp;D site and In-Water Demonstration Project</td>
<td>$45 Million</td>
<td>FOA expected January/February 2023; NOI released October 18</td>
</tr>
<tr>
<td>Front-End Engineering Design (FEED) Studies for Production of Critical Minerals and Materials (CMM) from Coal-Based Resources</td>
<td>$32 million</td>
<td>Solicitation expected January 2023; NOI released October 12</td>
</tr>
<tr>
<td>Industrial Decarbonization and Emissions Reduction Demonstration-to-Deployment</td>
<td>$500 million</td>
<td>NOI released December 22, 2022; FOA expected February 2023</td>
</tr>
</tbody>
</table>
INFLATION REDUCTION ACT

Meeting the Biden Administration’s Goals

The law provides $370 billion to support the deployment of clean energy technologies and reduce greenhouse gas emissions to help combat climate change and help meet the Biden Administration’s target of cutting emissions by 52 percent from 2005 levels by 2030.

Key elements:

• $222 billion for clean energy production and investments tax credits
• $148 billion for expanded or new climate and clean energy programs

Source: Rhodium Group. The range reflects uncertainty around future fossil fuel prices, economic growth, and clean technology costs. It corresponds with high, central, and low emissions scenarios detailed in Taking Stock 2022.
CLIMATE AND CLEAN ENERGY APPROPRIATIONS FOR FEDERAL AGENCIES—$148 BILLION

IRA Funding for Federal Agencies ($ in billions)

<table>
<thead>
<tr>
<th>Agency</th>
<th>Total Appropriation</th>
</tr>
</thead>
<tbody>
<tr>
<td>USDA</td>
<td>$46.684 billion</td>
</tr>
<tr>
<td>EPA</td>
<td>$41.491 billion</td>
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<tr>
<td>DOE</td>
<td>$35.292 billion</td>
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<tr>
<td>DOI</td>
<td>$6.646 billion</td>
</tr>
<tr>
<td>DOT</td>
<td>$5.442 billion</td>
</tr>
<tr>
<td>GSA</td>
<td>$3.375 billion</td>
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<tr>
<td>DOC</td>
<td>$3.310 billion</td>
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<tr>
<td>USPS</td>
<td>$3.015 billion</td>
</tr>
<tr>
<td>HUD</td>
<td>$1 billion</td>
</tr>
<tr>
<td>DHS</td>
<td>$500 million</td>
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<tr>
<td>DoD</td>
<td>$500 million</td>
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<tr>
<td>FPIE</td>
<td>$350 million</td>
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<tr>
<td>FERC</td>
<td>$100 million</td>
</tr>
<tr>
<td>CEQ</td>
<td>$62.5 million</td>
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<tr>
<td>GAO</td>
<td>$25 million</td>
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<tr>
<td>OMB</td>
<td>$25 million</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$147.817 billion</td>
</tr>
</tbody>
</table>

USDA | EPA | DOE | Other
Nuclear: $700 million for High-Assay Low-Enriched Uranium Availability Program to establish and carry out a program to support the availability of HA-LEU for civilian domestic research, development, demonstration and commercial use. This includes:
• $100 million to carry out licensing and regulatory programs in support of HA-LEU research and development with commercial entities, including transportation packaging design;
• $500 million for acquisition, stockpiling and stakeholder assessment; and
• $100 million for support of civilian domestic R&D and commercial use of HA-LEU.

Manufacturing and Industrial Grants: $2 billion for the Domestic Manufacturing Conversion Grant Program for the domestic production of efficient hybrid, plug-in electric hybrid, plug-in electric drive and hydrogen fuel cell electric vehicles and $5.8 billion for the Advanced Industrial Facilities Deployment Program for projects aimed at reducing emissions from energy intensive industries, including producers of iron, steel, steel mill products, aluminum, cement, concrete, glass, pulp, paper, ceramics, chemicals and other energy-intensive processes.

Clean Energy Financing: $12 billion for the DOE Loan Guarantee Program to open up an additional $68 billion in financing (commitment authority) for clean energy technologies, critical minerals production, electric vehicles, energy infrastructure, and Tribal energy projects.


ELIGIBILITY FOR INSTITUTIONS OF HIGHER EDUCATION

EPA Environmental and Climate Justice Block Grants ($3 billion):
Grants for community-led projects in disadvantaged communities and community capacity building centers to address disproportionate environmental and public health harms related to pollution and climate change.
  • Eligible funding recipients will be community-based nonprofits or organizations, or a partnership between community-based nonprofit organizations and a tribe, a local government or an institution of higher education.
  • Eligible activities include:
    • community-led air and other air pollution monitoring, prevention and remediation, investments in low- and zero-emission and resilient technologies, and workforce development that help reduce GHG emissions and other air pollutants;
    • mitigating climate and health risks from urban heat islands, extreme heat, wood heater emissions and wildfire events
    • climate resiliency and adaptation;
    • reducing indoor toxics and indoor air pollution; or
    • facilitating engagement of disadvantaged communities in state and federal public processes.

Department of Transportation Alternative Fuel and Low-Emission Aviation Technology Program ($300 million)
Competitive grant program for higher education institutions, among others, for projects that develop, demonstrate or apply low-emission aviation technologies or produce, transport, blend or store sustainable aviation fuels (SAF), including:
  • $244.53 million for production, transportation, blending, and storage of SAF;
  • $46.53 million for low-emission aviation technologies, and
  • $6 million for administration and oversight.

NOAA Investing in Coastal Communities and Climate Resilience ($2.6 billion)
For conservation, restoration and protection of coastal and marine habitats and resources, including fisheries, to prepare for extreme storms and climate change effects, as well as for projects that support natural resources to sustain coastal and marine resource dependent communities.
CHIPS AND SCIENCE

- 4 Microelectronics Research Centers
- At least 5 Regional Clean Energy Innovation Centers
- 2 Carbon Storage Research and Geologic Computational Science Centers
- At least 2 Fusion Reactors System Design Teams
- 2 Carbon Materials Research Centers
- High Performance Computing For Fusion Innovation Center
- Midscale Research Centers for Earth and Environmental Systems Science
- 2 New Bioenergy Research Centers
Funding Outlook: In FY 2023, NSF is funded at $9.9 billion, an increase of $1.04 billion or 11.7 percent over the FY 2022 enacted level (NOTE: this is through supplemental funding).

Significant growth for NSF in FY 2023 is supported by supplemental funding, including $700 million in general funding for the agency and $335 million specifically for implementation of the science provisions in CHIPS and Science Act. The supplemental funding is available through FY 2024.

Research and Related Activities across NSF are funded at $7.84 billion, an increase of 9.5 percent over the FY 2022 level

• Climate Science and Sustainability Research - $970 million, an increase of 7.8%, with an emphasis on climate change and clean energy - [Note: NSF may choose to invest more in this area.]
• Continued focus on Emerging Technology Areas (AI, Quantum, Advanced wireless, advanced manufacturing, biotechnology, semiconductors), most with 6-9% increases.
• Mid-Scale Research Infrastructure R1 program is supported at $50 million, an increase of 54 percent
• The New Technology, Innovation, and Partnerships (TIP) Directorate, is supported, but not allocated specific funding amounts. Within TIP the Regional Innovation Engines program is supported and the omnibus and encourages NSF to coordinate with EDA.
• NSF is directed to allocate no less than FY 2022 enacted levels to maintain core research programs

STEM Education is funded at $1.37 billion, $240 million or 36.3 percent above the FY 2022 level.
• Funding includes support for the Graduate Research Fellowship Program (GRFP) (previously under the Research and Related Activities account); and increases to programs to support broadening participation.
Resilience and Sustainability Priorities:

- interdependencies of climate change and clean energy to ensure sustainable and equitable social, engineered, and natural systems;
- infrastructure needs for strengthening the Nation’s resilience, security, and the stability of our energy supplies, including intelligent interconnection of built infrastructure, energy infrastructure, and cyberinfrastructure for overall resilience and efficiency;
- energy use as a sociotechnical system and enable ways to use energy more efficiently and increase the use of clean energy.
- new generation of energy technologies, materials; and
- manufacturing processes in a sustainable manner while improving long-term impacts on human health and the environment.
NEW CLIMATE AND CLEAN ENERGY OPPORTUNITIES PROPOSED IN FY 2023

- **Regional-scale convergence accelerator** platform to support cohorts of convergence accelerator teams on challenges in agriculture, energy, transportation, and other specific areas.

- **Regional climate impact integration hubs**, focused on climate innovation, mitigation, adaptation, and equity.

- **National Discovery Cloud** (NDC) for Climate that would include input from NSF-funded advanced computing resources and other NSF facilities.

- A new Directorate for Geosciences (GEO) investment that would support **large-scale interdisciplinary work on climate change**, including a focus on forecasting/climate modeling at scales needed for decisionmakers.

- **Open Science Initiative** for data infrastructure, which would provide expanded support for computation and cyberinfrastructure development and focus on revolutionizing data structures and architectures to address critical questions on climate. NOTE: GEO Open Science Ecosystem proposals are due March 16, 2023.

- **Global Centers program** would support interdisciplinary and international teams focused on use-inspired research and education, focused on climate and clean energy.

- **Round 4 of AI Institutes**, including climate and weather focus areas in partnership with NOAA and carbon capture and other climate-related topics in partnership with USDA.
Clean energy investments complement and align with NSF investments to advance climate change understanding, adaptation, and mitigation.

- Clean-energy investments in high-risk, high-reward ideas focused on:
  - Increased energy efficiency
  - Enhanced Sustainability
  - Mitigating climate change
  - Social benefits from clean energy production
- FY 2023 investments include:
  - Fundamental and Convergent Research
  - Energy Research Infrastructure
  - Innovation and Translation
  - Education and Workforce Development

Clean Energy Technology Funding

<table>
<thead>
<tr>
<th>Clean Energy Technology Funding</th>
<th>FY 2023 Request</th>
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<tr>
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¹ FY 2021 funding for TIP is shown for comparability across fiscal years.
² Funding includes resources for agency-wide initiatives.
FOCUS ON CLEAN ENERGY TECHNOLOGY IN FY 2023

In FY 2023 NSF plans to advanced cross-cutting fundamental energy research, including:

• Convergent clean-energy research to support: improvements in generation, conversion, storage, and distribution of electricity and fuels; advancements in renewable clean-energy sources; development of new energy materials; and more efficient energy usage;
• Investments in energy research infrastructure to allow for the creation of more energy-efficient energy systems and more efficient and sustainable computing systems;
• NSF will accelerate the transition of research results to the market through specific accelerator programs, NSF Centers, and by working with partners such as DOE and DOD; and
• Support education and workforce development to prepare a diverse clean energy workforce by focusing ongoing workforce development programs on clean energy.
NEW DIRECTORATE FOR TRANSLATION, INNOVATION, AND PARTNERSHIPS (TIP)

TIP will work in close collaboration with all of NSF’s directorates to “advance use-inspired and translational research in all fields of science and engineering, giving rise to new industries and engaging all Americans — regardless of background or location — in the pursuit of new, high-wage jobs in science, technology, engineering and math (STEM).”
Flagship TIP Program - Use-Inspired Research Around Societal and Technology Challenges

- NSF plans to provide up to $160 million per Engine over 10 years.
- Concept papers were due June 30, 2022, and almost 1,000 were submitted. A list of submitted concept papers can be found at: https://beta.nsf.gov/funding/initiatives/regional-innovation-engines/find-potential-nsf-engines.
- Type 1 (Developmental) proposals (up to $1M for 2-years) were due September 29, 2022, and Type 2 proposals (up to $160M for 10-years) were due January 18, 2023.
- Regional focus – consider regional challenges/opportunities and existing resources to promote innovation across more diverse geographies.

Key Components:
- “Advance critical technologies
- Address national and societal challenges
- Foster partnerships across industry, academia, government, nonprofits, civil society, and communities of practice
- Promote and stimulate economic growth and job creation
- Spur regional innovation and talent”

Long-term, Engines will...
- “Drive R&D innovation to achieve regional economic growth”
- “Build an inclusive innovation ecosystem that will thrive for decades to come”
DEPARTMENT OF TRANSPORTATION
Advanced Research Project Development (ARPD) will support novel, early-stage research for transportation infrastructure technologies

- Focus on reducing costs, minimizing environmental impacts, improving safety and increased resilience
- ARPA-I will operate as a distinct entity within DOT and is imbued with independence
- $3.2 million was provided in FY 2023, mainly to hire staff and develop a strategic plan for the office

Transportation Resilience and Adaption Centers of Excellence (TRACE)

- New Program authorized by the IIJA, still needs to be funded through annual appropriations. Congress provided $10 million in FY 2023. Encouraged partnerships with HBCUs and underserved communities.
- 10 Regional COEs, 1 National Coordinating COE
- Areas of Emphasis include supporting climate vulnerability assessments informed by climate change science and relevant feasibility analyses of resilient transportation improvements, and transportation resilience planning.

Advanced Transportation and Congestion Management Technologies Deployment Program

- Competitive grants for the development of large-scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment.
  - Funded at $60 million with 5-10 awards per year
  - Solicitation released in summer annually
Bipartisan Infrastructure Bill established new Joint DOT/DOE office for EV charger deployment

• Goal of deploying 500,000 chargers nationwide

• $7.5 billion in funding from Infrastructure Bill

  • $5 billion was provided as formula funding to be allocated to states as part of the new National Electric Vehicle Infrastructure Formula Program. Solicitation expected in Fall 2022.
    • DOT expected to release minimum standards and a “Buy America” waiver for the grant program soon.
    • Continuing to work with closely with states on their proposals to spend the funds.

  • $2.5 billion for competitive grants to promote the deployment of publicly accessible EV charging infrastructure along designated alternative fuel corridors and in communities.
    • 50% for community grant programs in rural or low-income areas
The Federal Aviation Administration (FAA) is developing Sustainable Aviation Fuels (SAFs)

• $38 million provided in FY 2023 to accelerate research with transformative impact potential in the areas of sustainable fuels, unleaded fuels and aircraft technologies.

• The Continuous Lower Energy, Emissions and Noise (CLEEN) Program is the FAA's principal environmental effort to accelerate the development of new aircraft and engine technologies.
  • CLEEN projects are about to enter Phase III
SERDP conducts fundamental research in DOD environmental land management and climate resilience and advanced technology development for near-term needs.

Annual funding opportunities

• Open broad agency announcement (BAA). Proposals due in January annually.
• SERDP Exploratory Development (SEED) fund: $250K or less for 1-year high-risk, high-reward experiments.

Program areas include Installation Energy and Water, Environmental Restoration, Conservancy, and Resiliency

• Technologies to improve energy efficiency, increase the use of renewable energy, and enhance water conservation on DOD installations
• Understand ecosystems and land management in order to maintain and restore diverse landscapes to be used for training future generations of warfighters
• FY 2023 focus areas included PFAS abatement and alternatives, sustainable energetics, and wildfire research

Operational Energy (OE) Innovation Program

• Provides $80 million annually to improve OE elements of DOD forces
• FY 2023 solicitation released in May 2022, proposals due August 2022
• Focus areas include: Aviation and Space Efficiencies, Congested Logistics, and Ground Vehicle Electrification.
DEPARTMENT OF COMMERCE
One of the Largest Proposed Economic Development Investments Ever

- $10 billion over five years for the Department of Commerce (DOC) to launch at least 20 Regional Technology and Innovation Hubs around the country, including at least three per Economic Development Administration (EDA) region (18). Will support smaller planning and larger implementation awards.

- Funding would support research and development, workforce training, regional strategies, infrastructure, business activity related to domestic supply chain, attraction of investments, manufacturing development, commercialization, entrepreneurship support, and more around a technology or innovation sector critical to national and economic security.

- $500 million was provided in FY 2023 to jumpstart the program - $459 million funded through supplemental that’s available until expended. EDA is determining timing and number of hubs.

Partnership Considerations and Regional Diversity

- Strong interest in getting away from “superstar metro areas” – ex: Boston, the San Francisco Bay Area, San Jose, Seattle, and San Diego.

- Multifaceted partnerships are required, including university, state, local, and industry partners with many optional partners including federal labs, federal manufacturing centers, NSF Engines, and more

- Various parameters in CHIPS to ensure geographic diversity, including: 1/3 of the hubs must benefit small and rural communities (population of less than 250,000), 1/3 must contain an EPSCoR member, and least one hub must be led by a state that is both “low population” and EPSCoR

Focus Areas

- The bill encourages (but does not mandate) regional tech hubs to focus one or more of the 10 key technology areas: artificial intelligence (AI) and machine learning; high performance computing; quantum information science and technology; robotics and advanced manufacturing; disaster prevention and mitigation; advanced communications and immersive technology; biotechnology and synthetic biology; data management and cybersecurity; advanced energy and efficiency technologies; and advanced materials science
$300 million in IRA funding for new Greenhouse Gas Monitoring Program

- IRA funding to NRCS focused on supporting the deployment of climate-smart practices on U.S. farms, ranches, and forestlands.

- The goal of this new program is to quantify carbon sequestration and carbon dioxide, methane, and nitrous oxide emissions at the field scale.

- NRCS is specifically interested in projects that can improve, expand, and/or build on scientifically-designed quantification systems to monitor and quantify improvements in soil carbon, reductions in nitrogen losses, and the reduction, capture, avoidance, or sequestration of carbon dioxide, methane, or nitrous oxide emissions, associated with agricultural production.

- RFI issued in November and closed end of December. NRCS plans to move forward with first block of funding in Spring 2023.
CLIMATE AND ENVIRONMENTAL HEALTH
EPA's $802 million science & technology research budget is primarily directed towards intramural research and projects designed to inform the agency's regulatory mission.

Main S&T Funding Mechanisms
- **Science to Achieve Results (STAR):** $28.6M for extramural awards, award size ~$750K-$2M
- **National Priorities:** $9.5 M for extramural awards, increased 12.5% relative to FY 2022, focused on water
- **Environmental Justice:**
  - $108M for disadvantaged communities in FY 2023, latest solicitation due April 10, 2023
  - Capacity Building for Initiatives to implement the *Inflation Reduction Act* and items from the *Bipartisan Infrastructure Package*
    - $68 million RFA for Environment Finance Centers
    - $50 million RFA for Environmental Justice Thriving Communities Technical Assistance Centers Program
    - $3 billion in Environmental Justice Programming from the IRA for the Office of Environmental Justice and External Civil Rights

Research Priorities
- Core Programs each guided by a Strategic Research Action Plan (StRAP)
  - Air & Energy
  - Chemical Safety for Sustainability
  - Health and Environmental Risk
  - Homeland Security
  - Safe and Sustainable Water Resources
  - Sustainable and Healthy Communities
- Some research priorities dictated by Congress
  - Environmental Justice
  - PFAS/PFOA
  - Water Quality/Availability
  - GHG Emission Monitoring
  - Wildfire Related Impacts
  - Stormwater Research Centers
• From 2011 – 2020 NIH invested about $10 million a year across 21 ICs for 350 unique awards in climate and health.

• Biden Administration interest in whole-of-government approach to climate (Executive Order 14008) led to reinvigorated approach to climate health work at NIH, led by NIEHS given their mission and expertise
  • Leadership from FIC, NIMHD, NIMH, NINR, NICHD, and NHLBI also highly involved

• $100 million increase for Climate Change and Health Initiative included in President’s Budget Request in FY 2022 but not included in FY 2022 omnibus

• Although funds were not provided, NIH developed a framework for the Climate Change and Health Initiative and used existing resources in a more limited capacity than planned to kick start the initiative:
  • Notice of Special Interest for NIH’s interests in this area released in June 2022 – still active
  • Administrative supplements to existing grants were available in summer 2022
  • Research Coordinating Center to Support Climate Change and Health Community of Practice will be awarded in 2023 to coordinate current NIH-funded work.
Climate Change and Health (CCH) Initiative – Funded at $40 million in FY 2023

- $100 million increase for Climate Change and Health Initiative included once again in the FY 2023 President’s Budget Request and was included in the FY 2023 Senate draft bill.

- FY 2023 omnibus appropriations package included $40 million in dedicated funding for NIEHS to “support research on a wide range of health conditions, which may include infectious disease, and chronic conditions such as asthma, mental health, and health disparities.”
  - Funding understood by NIEHS to be for Climate Change and Health Initiative; the words “climate change” left out to avoid political pushback

- NIH plans to use this funding to support interdisciplinary research grants relevant to climate health – will focus on funding individual investigators/small teams rather than large center grants
The Agency for Healthcare Research and Quality (AHRQ) is currently seeking proposals through a Special Emphasis Notice focused on intersections of climate change and healthcare.

Measuring & Reducing Carbon Footprint
- What practice & policy interventions are most effective and efficient in reducing the carbon footprint of healthcare organizations and the healthcare supply chain?
- What measures best capture healthcare organizations’ carbon footprints in a way that’s comparable for purposes of reporting and benchmarking, in particular for Scope 3 emissions?
- How can healthcare organizations move to a more circular economy that emphasizes environmentally-friendly purchasing, re-use, and waste reduction?

Increasing Resilience
- What measures of organizations and communities best predict healthcare organizations’ resilience in the face of extreme weather events and other climate-related issues such as supply chain disruption?
- What infrastructure, technology and actions are associated with increased resilience?
- What are the most promising resilience practices to scale up?

Addressing Equity
- How can healthcare organizations and providers use data to identify vulnerable patients and climate-related health threats?
- What are the most effective ways for healthcare providers to engage with patients and communities around climate issues in order to prepare for and respond to threats?
- How can healthcare organizations address historic and structural racism and other inequities in their climate and environmental activities?
THANK YOU!

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