DOE strategic framework: these are the strategic goals that informed departmental activities over the last 4 years. Portions of this have been published in other documents and is being presented in full here.

Contents

Overview

The Department of Energy (DOE) is responsible for ensuring America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science, technology, and policy solutions.

DOE's mission areas provide an opportunity to advance equity and justice across sectors. For low-income households grappling with issues of energy burden and energy insecurity, DOE's Weatherization Assistance Programs provide an opportunity for financial security. For colleges and universities, including Minority Serving Institutions (MSIs) and Historically Black Colleges and Universities (HBCUs), DOE funding provides critical supports to advance basic research and also train the next generation of Science, Technology, Engineering, and Math (STEM) workforce. For businesses, including Small Disadvantaged Businesses (SDBs), DOE contracting and acquisition can advance economic opportunity while helping DOE deliver on its mission. For Tribal Nations, DOE can offer technical assistance and investment in projects to help Tribes pursue energy priorities to benefit communities. DOE is also a critical leader in the all-of-government approach to tackle the climate crisis and deliver on the Justice40 Initiative, which supports the goal that 40 percent of the benefits of clean energy, energy efficiency, and climate investments flow to disadvantaged communities.

DOE is additionally committed to advancing equity and inclusion through its hiring, procurement, financial assistance, research and development, demonstration, and deployment activities.

In February 2022, DOE reorganized into a new structure that optimizes DOE's expertise and bolsters the Department's ability to pull every lever we need to tackle climate change, build the clean energy economy, boost American competitiveness, ensure affordable energy for all Americans, modernize America's infrastructure, and empower all communities. DOE is reorganized under three Under Secretaries who manage the core functions that carry out the DOE mission: Infrastructure, Science and Innovation, and Nuclear Security, with significant additional cross-cutting work across the Department. DOE's work is executed by over 15,000 federal employees (including approximately 1,500 employees with the Federal Energy Regulatory Commission) and 121,000 contractor employees at the Department's headquarters in Washington, DC, and at more than 80 field locations, with the Department committed to hiring approximately 750 new federal employees to support the implementation of the November 2021 Bipartisan Infrastructure Law and approximately 300 new federal employees to support the implementation of the August 2022 Inflation Reduction Act (IRA).

DOE boasts a system of 17 National Laboratories that have served as the Nation's leading institutions for scientific innovation for more than 75 years. These institutions continue to work toward groundbreaking discoveries to advance the Department's science and technology agenda, including the operation of national scientific user facilities used by over 40,000 researchers from academia, government, and industry. The National Laboratories are a system of intellectual assets unique among world scientific institutions and serve as regional engines of economic growth for states and communities across the country.

Infrastructure. DOE will play a key role in driving the timely, equitable, and efficient transformation of the Nation's energy system. To meet the urgency of this transformation, DOE funds demonstration and deployment activities to address unique challenges to rapid scale-up and commercialization. These include investments to support secure energy supply chains, as well as assistance for installing energy efficient appliances and systems, which will reduce Americans' energy bills. Deployment efforts across the agency will accelerate adoption and drive domestic production of existing and new energy technologies that can reduce, avoid, or sequester greenhouse gas (GHG) emissions while developing and expanding the Nation's clean energy workforce.

Science and Innovation. Achieving net zero emissions will require deployment of advanced technologies and materials that are not yet commercially viable. To this end, DOE invests in research and development – applied research to develop new and lower-cost technologies, as well as basic research that underpins our understanding of climate change and clean energy, including fundamental science to transform manufacturing. For example, DOE supports the development of the highest resolution climate prediction systems, that are used not only to advance climate and environmental sciences but to also support the applied offices and market deployments through detailed risk and resilience analyses. In addition, DOE is unmatched in performing in cutting edge basic science that will lead the world with next generation energy systems, that extend from genomic science and high-energy physics to bioenergy and modular nuclear reactors. DOE uses these research and development investments to assure that the United States leads the world in energy innovation, job creation, and solutions that address climate, environmental, and energy challenges.

Nuclear Security. DOE supports the security and safety of our Nation through five major national security endeavors: (1) maintaining a safe, secure, and effective nuclear deterrent; (2) reducing global nuclear threats and keeping materials out of the hands of terrorists; (3) providing safe and integrated nuclear propulsion systems for the U.S. Navy; (4) strengthening key science, technology and engineering capabilities in support of certification and assessment of current and future stockpile modernization programs; and (5) modernizing the nuclear security infrastructure and providing necessary federal oversight for growing mission requirements.

Environmental Stewardship. DOE is responsible for the environmental cleanup program resulting from six decades of nuclear weapons development and production and government-sponsored nuclear energy research. Through direct oversight by the Deputy Secretary, DOE pursues its cleanup objectives safely within a risk-informed framework of regulatory compliance commitments, best business practices, and community engagement.

Management and Performance. As DOE carries out this mission, it will strengthen the effective management and integrity of its programs, activities, and resources, lead by example in mitigating and adapting to climate change and provide a safe and secure environment for all employees. For more regarding the Department's approach to evaluation and evidence-building to improve performance across the broad range of the Department's program and functional offices, refer to: DOE Program and Functional Offices Evaluation/Evidence-Building Activities, FY 2024 Evaluation Plan, Learning Agenda and Capacity Assessment (energy.gov).

Department Of Energy Strategic Plan Framework And Crosswalk

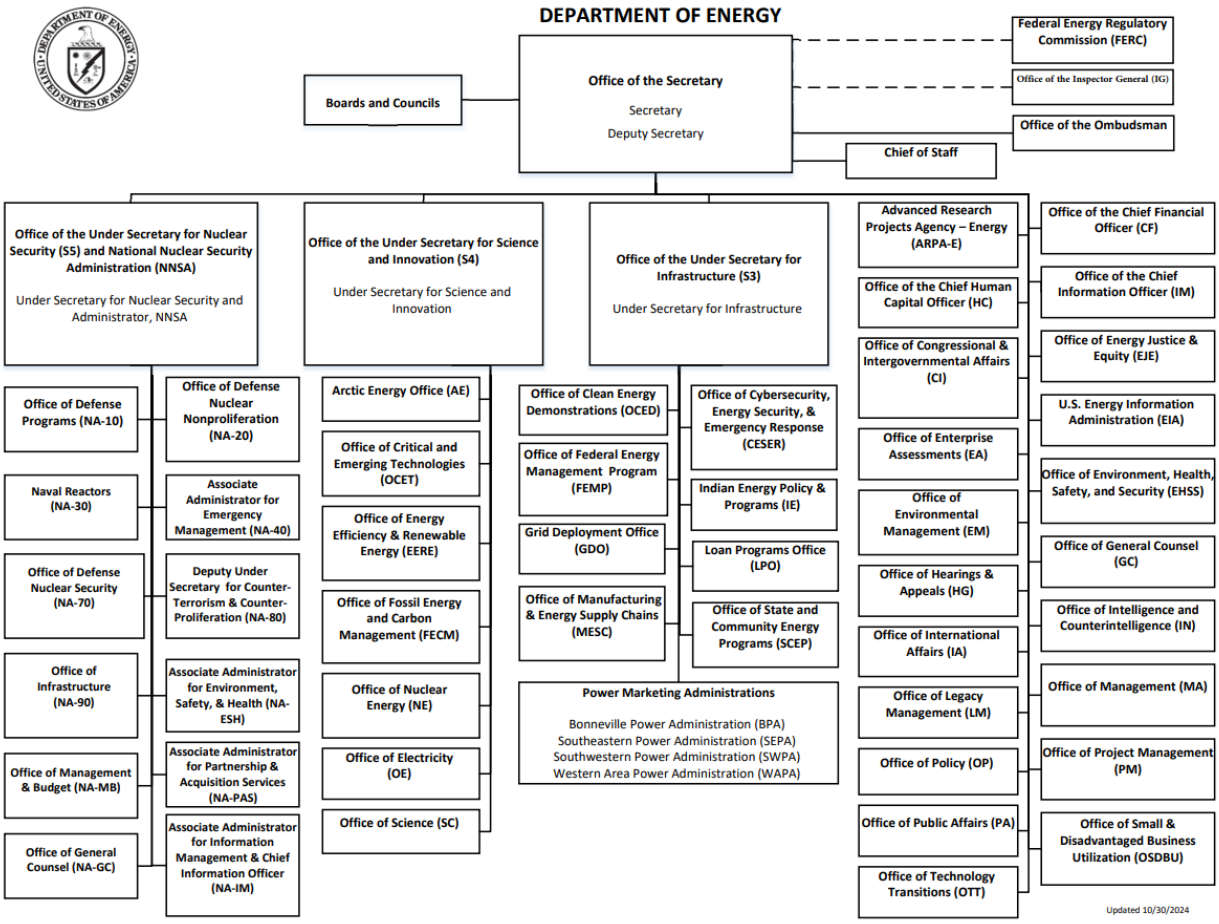
Mission Statement: Strengthen the Nation's prosperity and security by addressing energy, environmental, climate, and nuclear challenges through transformative science, technology, and infrastructure solutions.

			Infrastructure	Science and Innovation	Nuclear Security	Environmental Stewardship	Management and Performance
APG 1: Clean Energy Innovation and Deployment	Contributing Programs: BERE, FECM, OE, NE, OCED, MESC, LPO, PBMP, SCEP, GDO, CESER, IE, OP, SC, IA, OTT, PMAs	**Goal 1: Drive U.S. Energy Innovation and Deployment on a Path to Net-Zero Emissions by 2050** *Joint APG (with DOT): Electric Vehicle Charging Infrastructure deployment under BIL*					
		Objective 1 — Drive innovation of cost-efficient and affordable clean technologies and solutions through Research, Development, Demonstration and Deployment (RDD&D)	•	•			
		Objective 2 — Accelerate deployment of clean technologies at scale and pace	•	•			
		Objective 3 — Engage internationally to achieve global decarbonization and energy security while expanding markets for U.S. clean energy goods and services	•	•			
		Objective 4 — Catalyze clean energy solutions for job creation and economic growth, including with a robust place-based focus	•	•			
APG 2: Energy Sector Cybersecurity	Contributing Programs: CESER, OE, OP, IN, OCED, MESC, GD, LPO, PMAs, SCEP, BERE, FECM, NNSA, NE, IA, OPR, EM, ED	**Goal 2: Strengthen the Nation's Energy Security, Resiliency, Affordability, and Reliability**					
		Objective 5 — Develop and deploy innovative solutions to harden energy infrastructure against physical threats including climate change	•	•			
		Objective 6 — Advance adoption of solutions to prevent and respond to cyber vulnerabilities and incidents	•	•	•		
		Objective 7 — Secure the supply chain for a robust clean energy transition	•	•	•		
		Objective 8 — Support an effective emergency response capability in the federal government for responding to critical energy events			•	•	•
		Objective 9 — Implement consolidated interim storage for the Nation's spent nuclear fuel		•		•	
APG 6: National Laboratories	Contributing Programs: SC, NNSA, NE, BERE, FECM, IN, OTT, EM, OCED, MESC	**Goal 3: Advance Scientific Discovery and National Laboratory Innovation**					
		Objective 10 — Advance basic scientific understanding and identify new methods and tools to further discovery		•	•		
		Objective 11 — Lead globally in key innovation and national security areas including clean energy technologies artificial intelligence, quantum information sciences, microelectronics, advanced computing, particle accelerator technologies, and next generation biology		•	•		
		Objective 12 — Commercialize innovations to improve the lives of Americans and the world		•	•	•	
APG 4: Nuclear Security	Contributing Programs: NNSA, NE, IN	**Goal 4: Ensure America's Nuclear Security by Harnessing Unparalleled Science and Technology Capabilities**					
		Objective 13 — Design, deliver, and maintain a safe, secure, reliable, and effective nuclear stockpile in support of the Nation's integrated deterrent			•		
		Objective 14 — Forge solutions that enable global security and stability			•		
		Objective 15 — Harness the atom to safely, reliably, and affordably power a global fleet that enables unrivaled responsiveness, endurance, stealth, and warfighting capability			•		
APG 5: Equity and Justice	Contributing Programs: All DOE Programs	**Goal 5: Promote Equity and Energy Justice**					
		Objective 16 — Advance equity in DOE's procurement, funding, R&D and D&D processes and activities	•	•	•	•	•
		Objective 17 — Increase access to affordable, sustainable, and reliable energy for disadvantaged communities	•	•			
		Objective 18 — Ensure 40 percent of the overall benefits of relevant federal investments are delivered to disadvantaged communities	•	•	•	•	•
		Objective 19 — Support economic development, including through clean economy opportunities for workers in communities and industries in transition, like former coal and power plant communities	•	•			
		Objective 20 — Enhance engagement and energy economic development opportunities in Tribal communities		•			•
		Objective 21 — Support diversity and equity among researchers, projects, entrepreneurs, and the National Laboratories	•	•	•	•	•
APG 3: E M & Nuclear Waste Disposal	Contributing Programs: EM, LM, NNSA	**Goal 6: Advance Clean-Up of Radioactive and Chemical Waste**					
		Objective 22 — Support environmental remediation			•	•	
	Contributing Programs: HC, CF, ED, IM, MA, PA, EHSS, EA	**Goal 7: Operational Excellence**					
		Objective 23 — Attract, manage, train, and retain the best federal workforce to meet future mission needs					•
		Objective 24 — Use taxpayer funds efficiently and improve visibility into how funds are being used					•
		Objective 25 — Monitor departmental performance to ensure that program activities are executed in a safe and secure manner consistent with Departmental direction					•

Mission

Strengthen the Nation's prosperity and security by addressing energy, environmental, climate, and nuclear challenges through transformative science, technology, and infrastructure solutions.

Organizational Structure



Tribal and Stakeholder Engagement

The Department values its trusted partnerships with industry, civil society, government, and academia to strengthen effects on national security, public health and safety, and the U.S. economy. Coordination with partner agencies and stakeholder groups plays a critical role in supporting our Nation's nuclear deterrent.

DOE has increased focused engagements with underrepresented individuals and communities and hosted digital engagement events, designed to increase outreach on the cornerstone items of the Administration's environmental, social, and energy justice actions.

DOE regularly receives feedback from stakeholders through various processes. For example, DOE regularly interacts with Members of Congress and their staffs, obtaining feedback on the direction of DOE's programs and activities. Several DOE programs have Advisory Committees who provide DOE with the perspective of respective areas of interest. DOE engages with national intergovernmental groups, both formally and informally, to obtain input on DOE's priorities. DOE works with Indian tribes and organizations to promote Indian energy policies and initiatives to maximize the development and deployment of energy solutions for the benefit of American Indians and Alaska Natives. DOE staff, both at headquarters and in the field, share their views with DOE leadership. All interested parties, including private citizens, are able to provide comments to DOE by email through the agency's public website. DOE considered ideas, contributions, and feedback from all these sources in the development of the FY 2022-2026 strategic goals and objectives.

Goal 1: Drive U.S. Energy Innovation and Deployment on a Path to Net-Zero Emissions by 2050

The Biden-Harris Administration's Long-Term Strategy[1] calls for the United States to achieve a clean energy economy with net-zero emissions no later than 2050, with an interim target of reducing greenhouse gas emissions 50-52% below 2005 levels by 2030. To meet this challenge, the U.S. Department of Energy (DOE) will facilitate unprecedented advances in scientific research, applied energy R&D, and the deployment and commercialization of clean energy technologies and low-embodied carbon materials. Throughout the clean energy transition, DOE will work to ensure that all Americans retain access to affordable, reliable energy, and benefit from the creation of millions of quality jobs in the clean energy economy. DOE's collaboration with international partners will further amplify the benefits to American workers and communities as it supports partners in achieving their own clean energy and economic goals.

Internally, DOE will more closely integrate science and energy technology programs within its portfolio, emphasizing shared priorities and coordinated investment in decarbonization initiatives. Amplifying effective DOE domestic energy policies and strategies through international partnerships continues to be a key priority, necessitating close coordination between programs and international outreach. As ever, DOE will remain a reliable source of information for policymakers, energy markets, and the American public, promoting sound decision-making and awareness of the relationship between energy, the economy, and the environment.

Executing the provisions of the IIJA and IRA legislation is one of the Department's highest priorities. It is critical that this historic funding is executed in a manner that fulfils the needs of the American people in order to meet the Administration's goals of delivering clean affordable energy, creating quality jobs, and delivering benefits to all communities across the country, including those communities frequently left behind. The office structure of DOE before our realignment evolved out of our historic focus on R&D. Continuing our critical and enduring energy innovation programs while establishing new major demonstration and deployment missions requires a structure reflecting that tomorrow's DOE will carry out the full spectrum of research, development, demonstration, and deployment.

The Under Secretary for Science and Innovation will continue its critical work advancing the technologies needed to meet our energy and climate goals; and the new Under Secretary of Infrastructure is building specialized capabilities managing large-scale demonstration and deployment programs aimed at bringing technologies to the market. And offices within these two Under Secretariats will work closely together to innovate, demonstrate, and deploy solutions that meet the nation's climate and energy goals.

The focused, coordinated missions of our realigned structure will position the Department to

[1] The Long-Term Strategy of the United States, Pathways to Net-Zero Greenhouse Gas Emissions by 2050 (whitehouse.gov)

most effectively implement these programs – and more broadly, to benefit all Americans by catalyzing innovation, modernizing our infrastructure, and helping to address some of our toughest challenges.

DOE's science and energy goal has four strategic objectives:

Strategic Objective 1 – Drive innovation of cost-efficient and affordable clean technologies and solutions through Research, Development, Demonstration and Deployment (RDD&D)

Objective Leader(s)

- Under Secretary for Science and Innovation
- Under Secretary for Infrastructure

Contributing Program(s)

- Energy Efficiency & Renewable Energy
- Fossil Energy and Carbon Management
- Electricity
- Nuclear Energy
- Clean Energy Demonstrations
- Manufacturing and Energy Supply Chains
- Loan Programs Office
- Federal Energy Management Program
- State and Community Energy Programs
- Grid Deployment Office
- Cybersecurity, Energy Security, and Emergency Response
- Indian Energy
- Policy
- Science
- International Affairs
- Technology Transitions

Sustained reductions in greenhouse gas emissions over the long term will require deployment of existing solutions as well as new solutions and breakthrough advancements that support cost effectiveness and affordability. Immediate investments in RDD&D will set the stage for the technological innovations needed to accelerate the decarbonization of the energy system. In the near term, rapid deployment of existing clean energy technologies, including improvements to energy efficiency across all technologies and sectors and targeted benefits to disadvantaged communities, will help ensure steady progress towards the Administration's 2030 and 2050 goals; further our diversity, equity, and inclusion objectives; and support progress towards global climate and clean energy goals.

Make clean energy technologies the most cost-effective options for electricity generation nationwide

In addition to its 2030 and 2050 goals, the Biden-Harris Administration has set a goal of 100% carbon-free electricity generation by 2035. In support of this goal, DOE will continue to fund RDD&D to drive down the costs and accelerate the adoption of a wide range of clean electricity technologies. These include a range of technologies including, wind, solar photovoltaics, geothermal, hydropower, nuclear and carbon-based power generation with carbon capture and storage. Supporting a range of technology solutions and enhancing the grid of the future will

ensure that clean electricity technologies can become competitive in all areas of the country while maintaining reliability and resilience during a stable and equitable clean energy transition.

Modernize the electricity delivery system

A dramatic structural transformation of the electricity delivery system is needed to ensure reliability is maintained in light of the rapid integration of variable renewable generation and customer-based technologies, including efficiency and electrification of transportation and building infrastructure. The future grid will be a more dynamic and structurally complex system, with bidirectional power flows. Managing this transition will require significant reengineering, involving advancements in cybersecurity, grid technology, system architecture, and infrastructure investment strategies.

Facilitate transition to end-use electrification and enhance efficiency

Efficiency and electrification of end-uses across buildings, industry, and transportation will be a critical element of achieving the Administration's 2050 decarbonization goal. DOE will continue to support RDD&D that brings cost and performance parity to efficient electric options, such as heat pumps with low-global-warming-potential (GWP) refrigerants, electromobility, and electro-industrial processes (e.g., induction heating, electrolysis of iron ore). DOE will also continue to invest in key technologies that enable electrification, such as electric vehicle chargers, behind the meter battery storage, and distributed generation. Recognizing that electricity demand for a decarbonized economy is expected to grow over time, DOE will fund RDD&D to dramatically improve energy efficiency to make the transition affordable to households and businesses to better integrate electric technologies as they come online and enhance opportunities for flexible, electrified technologies to support an economically efficient, reliable, and resilient power system.

Transition to large-scale production of advanced clean and sustainable fuels

For areas where electrification presents challenges, like aviation, shipping and some industrial processes, enhanced use of clean fuels such as carbon-pollution free hydrogen and sustainable biofuels offer alternative decarbonization pathways. Clean fuels can also be utilized for long duration storage to support the electric grid. DOE will fund RDD&D to overcome the barriers to facilitate the widespread adoption of sustainable biofuels, which have a substantially lower carbon footprint than petroleum, drastically reduce the costs of producing clean hydrogen and support the standing up of a new clean hydrogen economy through the Hydrogen Hubs program.

Promote domestic clean energy technology in the manufacturing sector and secure supply chains for critical minerals and materials

The United States must be a leader in RDD&D for industrial decarbonization, clean energy manufacturing and the domestic manufacture and supply chains of energy intensive materials, clean fuels, fuel cells, electrolyzers, critical materials, batteries, and vehicles. Accomplishing the Administration's climate goals this decade and setting up the economy for further reductions after 2030 requires investment in innovation and U.S. manufacturing to lower the cost of new technologies needed in the future, grow the domestic manufacturing base and supply chains for

those technologies, and train the workforce needed. DOE will expand the domestic availability of materials required for the clean energy economy, including those with improved properties, such as advanced nuclear fuels. DOE will also support advances in recycling and reduced life cycle impacts for materials.

Many clean energy technologies rely upon critical minerals, the production of which will need to be expanded significantly over the next decade to meet climate change mitigation goals. A resilient, domestic, sustainable critical minerals (including rare earth elements) supply chain will be necessary to match the scale and speed of the climate challenge. DOE will continue to invest in RDD&D activities to identify, characterize, and quantify the resources available from secondary and unconventional sources (e.g., coal waste, produced water, mine tailings).

Bring Carbon Capture Utilization and Storage (CCUS) and Carbon Dioxide Removal (CDR) to commercial viability

The Long-term strategy of the United States points to the need for both carbon dioxide emissions mitigation and atmospheric-removal. DOE will prioritize RDD&D on carbon management mitigation technologies such as point-source carbon capture and storage (CCS) on power plants and industrial facilities as well as carbon dioxide removal (CDR) technologies, through approaches like direct air capture and storage (DACS), biomass carbon removal and storage (BiCRS), enhanced mineralization, and soil carbon sequestration, all with durable, reliable, and verifiable carbon dioxide (CO_2) storage. DOE will also work to develop novel approaches to convert carbon emissions, principally in the form of CO_2, into value-added products such as building materials, chemicals, and fuels using systems-based carbon management approaches.

Minimize methane emissions across the entire hydrocarbon fuel value chain

DOE's strategy for addressing methane emissions from the hydrocarbon fuel sector includes RDD&D efforts to improve capabilities and strategies for detecting and monitoring emissions across the oil and gas production, processing, transportation, and storage sectors, as well as for coal mining and renewable gas production.

Leverage international partnerships to accelerate RDD&D for priority technologies and sectors

The pace and scale of technological innovation needed to address the climate crisis will not be met with U.S. investments in RDD&D alone. We need additional capacity – human, technological and financial – to quickly bring new technologies from idea to commercial viability and to see them deployed in markets all over the world. DOE will leverage its international partnerships, especially multilateral initiatives like Mission Innovation and the Clean Energy Ministerial, to mobilize additional capacity from partner countries, research institutions and industry and drive RDD&D efforts globally. Through DOE's leadership, the United States will focus efforts across priority sectors and technologies so that we and our partners are delivering on shared outcomes, learning from each other, and amplifying

complementary domestic efforts like the Energy Earthshots[2].

Performance Goals

- Drive the reduction of the average levelized cost[3] of utility-scale solar photovoltaic generation in the U.S. to 3 cents/kWh utility scale solar.
- Demonstrate a 17MW low-temperature superconducting generator on a prototype wind turbine with over 50% improvement in torque density that eliminates reliance on rare earth minerals by 2026.
- Demonstrate the use of geothermal district heating and cooling systems in at least a dozen communities by 2026 in diverse geographies and community types.
- Demonstrate of new central heat pump water heating products by 2028.
- Publish of a Thermal Systems Decarbonization guide for large buildings by 2025.
- Launch of a commercial cold climate rooftop heat pump development challenge by 2025.
- Successful field demonstrate residential cold climate heat pumps from multiple manufacturers by 2027, heating capacity at -5F that is 100% of the capacity at 47F.
- Develop electrolysis technology (technology readiness level ranging from 3 to 7) to produce near-zero GHG hydrogen at $2/kg H2 by 2026 and $1/kg by 2031.
- By 2030, support scale-up of multiple high-volume, cost-effective biofuel production pathways with a focus on sustainable aviation fuel (SAF) capable of >70% GHG reduction by enabling the construction and operation of at least four demonstration-scale integrated biorefineries.
- Achieve cost parity with internal combustion engine vehicles by demonstrating a $60/kWh battery cell cost that is also low in critical minerals, 90% recyclable and capable of 15 min charge by 2030.
- Demonstrate hydrogen production from fossil and waste feedstocks to produce near-zero GHG hydrogen at $1/kg H2 by 2031.
- Validate pilot-scale combustion turbines firing 100% hydrogen with low NOx emissions and high efficiency by 2030.
  By 2026, reach commercial deployment of the first accident tolerant nuclear reactor fuel concepts with increased enrichment to realize higher burnup.
- By 2025, enable operation of the Microreactor Applications Research Validation and Evaluation (MARVEL) nuclear microreactor that will serve to demonstrate microreactor operations, non-electric end-use applications, and deployments appropriate for distributed electricity generation.
- By 2026, establish two test beds Laboratory for Operation and Testing in the United States (LOTUS) and Demonstration of Microreactor Experiments (DOME) for testing fueled advanced nuclear reactor designs to support licensing and commercialization of these technologies.
- Demonstrate successful deployment of a digital reactor safety system in an operating nuclear power plant by 2026.

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[2] Energy Earthshots Initiative | Department of Energy
[3] https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

- Provide the scientific and technical data and information from storage infrastructure and advanced storage R&D projects that support the commercialization of at least two carbon storage hubs capable of storing a minimum of 50 million metric tons each by 2030.
- By 2025, develop and publish the first U.S. prospectus showing critical minerals potential from various unconventional and secondary feedstocks.
- Accelerate development of technologies that reduce or eliminate the use of flares at the wellhead and demonstrate the potential for reducing average methane emissions from formerly flared gas by 90% by 2028.

Strategic Objective 2 – Accelerate deployment of clean technologies at scale and pace

Objective Leader(s)

- Under Secretary for Science and Innovation
- Under Secretary for Infrastructure
- Director, Office of Technology Transitions

Contributing Program(s)

- Energy Efficiency & Renewable Energy
- Clean Energy Demonstrations
- Fossil Energy and Carbon Management
- Nuclear Energy
- Electricity
- Technology Transitions
- Policy
- Loan Programs Office
- International Affairs
- Manufacturing and Energy Supply Chains
- Federal Energy Management Program
- State and Community Energy Programs
- Grid Deployment Office
- Indian Energy
- Western Area Power Administration
- Bonneville Power Administration

Achieving net-zero carbon emissions by 2050 will require rapid, large-scale deployment of low-carbon energy technologies as well as support for the adoption of currently available cost-effective solutions by low-income households. Long lead times and substantial construction and manufacturing scale-up timelines mean that deployment must accelerate now to allow for widespread commercialization by 2030 and a sweeping clean energy transition by 2035.

DOE's investments prioritize both the deployment of new technologies and the demonstration of their commercial viability. Establishing clear goals and fostering effective collaboration with partners in industry, including entrepreneurs and small businesses, supply chains, host communities, and labor will help ease the transition and reduce the risk associated with deployment.

Support the expansion of the Nation's transmission system and the widespread adoption of clean power generation

DOE will support the development, demonstration, and deployment of clean energy technologies while addressing key technical and regulatory barriers to widespread clean energy adoption, such as the planning and operation of an increasingly carbon-pollution free electric sector.

Where feasible, DOE will develop publicly available data, market and technology analyses, tools, and resources to support the strategic planning and targeted expansion of the Nation's transmission system, 100% carbon-pollution free electricity generation and other energy infrastructure. DOE will provide technical assistance to energy system stakeholders to utilize these tools and data in their planning and share best practices across the Nation. In addition to enabling the transition of the Nation's electric transmission infrastructure, DOE will develop and demonstrate innovative centralized and distributed technologies and planning practices to enhance community resilience to physical hazards and to support decarbonization goals. In addition, DOE will also work with energy sector stakeholders to identify and mitigate physical and cyber risks to a carbon pollution-free electricity system.

Accelerate the electrification of mobility and industrial energy use

The U.S. transportation sector consumes 70% of total U.S. petroleum, is the largest source of domestic greenhouse gas emissions, and contributes to poor local air quality that can disproportionately affect historically marginalized and overburdened communities. Globally, the sector is responsible for nearly a quarter of all carbon dioxide emissions from fuel combustion. Clean transportation is a vital service, connecting families to jobs, schools, and health care and allowing businesses to both receive goods and transport products to consumers.

DOE will work to commercialize zero-emission vehicles, both light duty as well as medium- and heavy-duty vehicles and the necessary refueling infrastructure that can enable widespread adoption in partnership with state, local and regional organizations. These efforts will help meet the President's goal of 50% sales of zero-emission light duty vehicles by 2030.

DOE will also support efficiency and electrification of industrial end uses, including high temperature heat pumps and electrolysis of iron ore processing, as well as indirect electrification through the use of hydrogen produced through electrolysis in industrial processes. Manufacturing innovations are required to deliver the clean energy technologies needed to decarbonize other sectors as well, including transportation, buildings, and the electric grid.

Decarbonize hard to electrify transportation and industrial technologies

DOE's basic research and applied research development programs will work on mobilizing biomass and waste feedstocks, efficiently capturing and converting CO_2, and developing carbon-efficient conversion processes to make clean fuels for hard to decarbonize modes of transportation and clean products to reduce industrial sector emissions. DOE will work with industry partners to scale up the next-generation renewable fuels and will support pilot- and demonstration-scale projects that employ advanced technologies to demonstrate the production of drop-in fuels for hard to decarbonize modes of transportation with a focus on sustainable aviation fuel (SAF). DOE will also collaborate with the Department of Transportation, U.S. Department of Agriculture, other federal, state, and local government entities, and a wide range of industry stakeholders to address technical challenges and market barriers to the expansion of domestic production and use of SAF in support of the government-wide SAF Grand Challenge. DOE will focus efforts on industrial decarbonization activities, including demonstrations, to address large opportunities and enable an accelerated timeline for achieving greenhouse gas

emission reductions especially in heavy industries such as steel, cement, and ammonia manufacturing, while enhancing American competitiveness in energy intensive, trade exposed industries. These activities leverage ongoing efforts to advance the deployment of clean hydrogen, in combination with mitigative carbon capture and storage. In addition, DOE will work to reduce greenhouse gas emissions in the agricultural sector through the improved efficiency of off-road agricultural vehicles, improved soil carbon management, improved utilization of animal and agricultural waste, and more efficient irrigation systems.

Accelerate the efficiency and efficient electrification of buildings

The buildings sector, with its key contributions to GHG emissions and electricity consumption and strong influence on people's everyday experiences, is a critical focal point for efforts to achieve economy-wide goals of deep emissions reductions, electricity system decarbonization, and benefits to disadvantaged communities. To ensure the building sector is on a course to deep decarbonization by mid-century, DOE is prioritizing equity, affordability and resilience across the following strategies: increasing building energy efficiency; accelerating building decarbonization; and transforming the grid edge at buildings.

Provide financing for clean energy deployment and demonstrations

The Loan Programs Office and other DOE financing programs will play a critical role in catalyzing investment in clean energy by providing loans and loan guarantees to project developers, enabling them to undertake innovative projects. DOE will help bring innovative solutions to market by validating these technologies at demonstration and commercial scale, thereby catalyzing and buying down the risks to unlock private sector capital. In addition, DOE will use federal loan and loan-guarantee authorities to support a range of clean energy and advanced vehicle technologies, providing access to capital at every deployment milestone and removing barriers to increased financing for clean energy deployment.

Ensure a thriving and resilient clean energy supply chain and domestic manufacturing sector and a safe and secure critical material supply chain

The U.S. manufacturing sector has an annual energy bill of about $200 billion, consumes roughly one-third of primary energy in the U.S., and produces 28% of the Nation's greenhouse gas emissions. DOE will work to reduce emissions while maintaining economic productivity by supporting the development of resilient, clean energy supply chains to ensure a thriving domestic manufacturing sector.

DOE will also provide technical assistance for diverse manufacturers in reducing their energy use intensity, adopting energy management programs, incorporating resilience into their operating systems, and providing targets for energy efficiency, productivity, waste reduction, and water use reduction practices.

DOE will invest in technologies to advance the safe and environmentally sustainable processing, refining, and separation of critical minerals (CM) and materials, especially those that are identified through its 2023 and future Critical Material Assessments, as well as carbon-based

materials (e.g., graphite, fiber) that impact the scale of the markets. Developing these facilities is a critical path to establishing domestic production. As part of a circular economy, DOE is minimizing waste and evaluating the co-production and by-products of CM/REE. While maximizing the value of the domestic resource base, DOE will foster international partnerships that ensure secure, sustainable, and affordable access to raw materials that the United States lacks but are essential to the manufacturing of clean energy technologies.

Support an All-of-Government approach to decarbonization, including partnering with state and local governments and stakeholders to deploy clean energy technologies

An accelerated deployment of clean energy technologies requires participation and coordination with both federal and non-federal partners, including states, localities, and Tribal groups. Through improved communication and proactive coordination across federal agencies, DOE will work to maximize the public benefits gained from the development and implementation of sustainable energy technologies and solutions. DOE will lead by example in addressing climate change by demonstrating clean energy technologies, setting ambitious carbon reduction goals, developing aggressive implementation plans, and acting with urgency to execute those plans. DOE, including the Federal Energy Management Program, will also support other federal agencies as they work to reduce greenhouse gas emissions from their operations, electrify their vehicle fleets and improve the efficiency of their buildings.

DOE will fund initiatives that empower state and local leaders to develop locally-driven, practical, and evidenced-based solutions to create clean energy jobs and local economies that can sustain them. DOE will help local communities build capacity and leverage the capabilities and expertise of the National Laboratories to inform local decision making. These programs will help ensure energy infrastructure is developed with local input and provides benefits to those local communities. This work will reinforce the Administration's Justice40 Initiative, with the goal of delivering 40 percent of the overall benefits of certain federal investments to disadvantaged communities.

Performance Goals

- Demonstrate at-scale geothermal drilling rock reduction daily average rate of penetration to 500 ft./day by 2026.
- By the end of 2025, demonstrate wind, solar, and/or battery storage projects providing ancillary grid services for at least a month at up to 3 utility systems with more than 50% of instantaneous renewable energy penetration.
- Weatherize over 154,000 homes over a 5-year period (FY 2022-FY 2026). By end of 2030, reduce the levelized cost of carbon dioxide removal technologies by 50% compared to current technologies. By end of 2026, initiate the construction of a facility(s) using first generation capabilities to produce 1-3 t/day of mixed rare earth oxide (MREO) and/or other CMs, to individual or combinations at high purity levels based on supply chain needs.
- Reduce energy use intensity by 50 percent from 2021 levels by 2030.

- By the end of 2026, initiate construction of two advanced non-light water nuclear reactor demonstrations.
- By the end of 2024, create market insights from data analyses through publication of at least nine Pathways to Commercial Liftoff reports.

Strategic Objective 3 – Engage internationally to achieve global decarbonization and energy security while expanding markets for U.S. clean energy goods and services

Objective Leader(s)

- Assistant Secretary for International Affairs

Contributing Program(s)

- Energy Efficiency & Renewable Energy
- Clean Energy Demonstrations
- Fossil Energy and Carbon Management
- Nuclear Energy
- Electricity
- Policy
- International Affairs
- Manufacturing and Energy Supply Chains

DOE plays a major role in the Administration's international efforts to work with countries to achieve significant global greenhouse gas emission reductions consistent with the Paris Agreement on climate change, enhance climate preparedness, promote global deployment of clean energy technologies, and enhance the competitiveness of U.S. clean energy goods and services in the global market valued at $23 trillion at a minimum by the end of this decade. Efforts will focus on implementing diplomatic, technical and policy collaborations with a strategic subset of countries and regions, prioritizing collaboration with partners that are regional leaders committed to net-zero goals and able to deliver results. Mechanisms for collaboration can occur through bilateral and multilateral engagement.

The international and domestic sourcing of critical minerals continues to be a challenge with significant barriers, including the siting, permitting, and operation of sourcing operations and facilities. International partners and allies could benefit from technical assistance, such as early-stage feasibility studies or mineral qualification, in overcoming barriers to supplying minerals in critical areas. Domestic communities and localities motivated to accommodate these operations could play a pivotal role in structuring meaningful relationships and leveraging commercial needs. The critical minerals sourcing activity aims to align the interests of mineral sourcing with the inherent challenges therein.

DOE plans to provide technical assistance, share lessons learned, and promote best practices and to encourage international harmonization of standards, assistance with clean energy policy and program planning and implementation. It also plans to provide assistance with promoting open investment environments with allies and foreign partners for clean energy solutions and strategies to counter malign influence that seeks to monopolize supply chains and resources; other actions to promote the development and responsible deployment of renewable energy; carbon capture utilization and storage; carbon dioxide removal; methane mitigation; safe and secure use of nuclear power; clean fuels; energy efficient technologies and services. DOE will also engage in strategic collaborations to leverage international resources and accelerate development of next generation clean energy technologies. Finally, DOE will engage U.S. allies

to develop stable critical supply chains, with a focus where possible on growing domestic industries, in order to help meet global clean energy goals. All of these efforts will be tethered to our domestic efforts to create markets for U.S. clean energy goods and services and create good-paying jobs.

Lead or actively participate in key multilateral initiatives focused on clean energy development and deployment

DOE launched and continues to play a leadership role in the Clean Energy Ministerial and Mission Innovation. Both initiatives engage mostly large developed and developing economies to advance common clean energy research and policy priorities. DOE can also advance emissions reductions through strategic guidance and active participation in other key multilateral organizations and forums, including the International Energy Agency, International Renewable Energy Agency, Nuclear Energy Agency, International Atomic Energy Agency, G7, G20, et al. In most of its multilateral engagements, DOE works closely with the White House and other agencies, such as the State Department, to ensure consistent and ambitious international energy policy across the U.S. government and use all diplomatic and implementation levers to achieve U.S. objectives.

Engage bilaterally with strategic emerging economies to provide targeted technical assistance

Major emerging economies with rapid economic growth provide the greatest opportunity to reduce emissions if we can work with them to decouple growth in greenhouse emissions from economic growth and help transition them to a pathway for sustainable development fueled by clean energy. Country-specific analysis of energy and emissions – coupled with investment strategies – can help target technical assistance to the sectors with the greatest opportunity for emission reduction and can provide confidence to country leaders to raise their level of ambition under the Paris Agreement.

Net Zero World will serve as the center of gravity for a whole-of-government approach to achieve these goals. Through this program, the interagency and the DOE National Laboratories will work with partner countries to co-create and implement highly tailored, actionable technology road maps that put net zero within reach. The program will also create tailored technical assistance to implement those roadmaps. It will also work with countries to create investment strategies to mobilize investment from U.S. government finance agencies, multilateral development banks, and the private sector. This work will accelerate the global transition to clean energy in strategically important partner countries. Public-private and interagency partnerships are critical for these engagements so that DOE can leverage the expertise of universities, laboratories, research institutions, trade associations, non-governmental organizations, philanthropies, civil society, and other Federal agencies.

Secure global clean energy supply chains

Natural disasters, as well as efforts by malign actors to monopolize specific sectors has demonstrated how vulnerable critical supply chains are to disruption. From critical raw materials to electronics to battery components, clean energy deployment relies on global trade. Working with strategic partners to develop clean and transparent supply chains and ensure a reliable supply of materials and components needed for clean energy technologies will enhance U.S. energy security while facilitating clean energy deployment at the speed and scale necessary to combat climate change. Modifications to national and international standards and trading policies will necessarily have a significant role to play to secure such supply chains, as well.

This cooperation will focus on creating environmentally sustainable governance and building clean energy capacity, including mineral and material resources, material processing, and scaleup, and other components for the clean energy supply chain as well as mineral resource tracing and tracking. To sustain these supply chains, the development of international cooperation and collaboration regarding end-of-life recovery and re-use of critical materials will be emphasized along with efforts to train the clean energy innovators and manufacturing energy management workforce of the future.

Leverage international resources to accelerate clean energy development through R&D partnerships

Like the U.S., many other countries make significant government investment in research and development for clean energy technologies. The expertise, facilities, and research funding of these countries can be coordinated with DOE efforts as we work toward common technical targets and breakthroughs in pre-competitive areas. DOE will continue to engage and explore expansion of research partnerships with key partners.

Performance Goals

- Drive implementation and strategy in the Clean Energy Ministerial and Mission Innovation to put 3-6 initiatives on track to deliver on their 2030 goals.
- Leverage forums like the G7, G20, Major Economies Forum, and others to encourage key emitting countries to adopt U.S. timelines and targets in deploying clean energy solutions in power (e.g. 100% clean power by 2035), transportation, and hard to abate sectors like steel, cement, and industrial processes.
- Effect a step change in key international energy organizations' governance and focus towards climate-forward clean energy innovation, deployment, and policy support.
- Strengthen European energy security, by supporting the increase and resiliency of grid interconnections and helping non-EU U.S. allies synchronize with the European grid, as a means of deterring the use of energy as a weapon.
- Expand Net Zero World to twelve priority countries, delivering bespoke technical strategies and working with them to create investment strategies to mobilize investment from outside sources such as U.S. financing agencies, multilateral development banks, and the private sector.

- Facilitate up to eight collaborations between foreign governments and the U.S. private sector to accelerate the deployment of U.S. manufactured advanced nuclear reactors through convenings, technical analysis, and high-level dialogue.
- Support exploring expansion of deployment of clean hydrogen in the Americas and elsewhere, where the United States has a competitive advantage.
- Collaborate with oil and gas producing countries representing 40 percent of global production to substantially drive down fugitive methane emissions, putting us on a path to meeting the Global Methane Pledge's commitment to reduce 30 percent of methane emissions from 2020 levels by 2030 and achieving net zero emissions by 2050
- Advance R&D partnerships with OECD Indo-Pacific partners in Hydrogen, CCUS, methane abatement, grid management, and energy storage with a goal to support the net zero targets of these countries as well as their goals under the Global Methane Pledge.
- Develop and implement 3-4 material-specific strategies with international partners to address domestic capacity gaps while improving diversity and resilience of high-capacity battery supply chains.
- By 2025, complete establishment and maturation of at least four regional Clean Energy Training Centers in nuclear newcomer countries.

Strategic Objective 4 – Catalyze clean energy solutions for job creation and economic growth, including with a robust place-based focus

Objective Leader(s)

- Under Secretary for Science and Innovation
- Under Secretary for Infrastructure
- Director for Energy Jobs

Contributing Program(s)

- Energy Efficiency & Renewable Energy
- Fossil Energy and Carbon Management
- Nuclear Energy
- Electricity
- Clean Energy Demonstrations
- Loans Program Office
- Grid Deployment Office
- State and Community Energy Programs
- Manufacturing and Energy Supply Chains
- Policy
- International Affairs

As DOE expands its role in the deployment of clean energy solutions, through the implementation of the weatherization program, demonstration projects, and other infrastructure and place-based initiatives, it will also play a more significant role in stimulating job creation and economic development. While DOE has invested in clean energy workforce development activities, particularly for engineering, STEM, and professional jobs, thus shaping the supply of workers into the labor market, the greater emphasis on deployment means that DOE now has growing influence over the jobs created and needs to consider tools to shape labor market demand for workers, including the quality of jobs, location, access, and ripple effects in the economy. Application of Build America Buy America requirements to programs for public infrastructure will also increase demand for domestic iron & steel, construction materials and manufactured products and associated jobs.

Adopt a labor compliance and data tracking system to measure direct job creation from DOE deployment activities in the construction industry

Traditionally, infrastructure investments and deployment activities stimulate job creation in the construction sector. Most of the jobs created from DOE deployment activities (i.e., grid infrastructure, demonstration projects from IIJA, etc.) will be in the construction industry and will be subject to the Davis-Bacon and Related Acts[4] under Section 41101 of the IIJA. This

[4] In addition to the Davis-Bacon Act itself, Congress has added prevailing wage provisions to approximately 60 statutes

ensures that public spending does not undercut local wages. Streamlined data collection, analysis, and reporting is necessary to guarantee compliance with Davis-Bacon and Related Acts, this method will also provide additional data tracking on job creation by geography and along other parameters. DOE will adopt a system that minimizes internal and funding recipient administrative burdens while maximizing the utility of the data collected.

Adopt reporting tools and templates to measure job creation, job quality, workforce development, and other economic benefits from DOE deployment activities in the industrial sector

As DOE invests in domestic production and manufacturing activity to support clean energy supply chains, many new jobs will be created. DOE will develop and implement reporting templates to track the wages offered to hourly production workers, the demographic representation of the new jobs created, and investments in workforce development. In addition, at a portfolio level, DOE will track and report on projects operating under collective bargaining agreements and with negotiated community benefits agreements.

Adopt apprentice utilization targets and goals for inclusive practices for construction-related deployment activities

The Davis-Bacon and Related Acts set a minimum for wages and fringe benefits in a given locality. It does not set standards for apprenticeship utilization or workforce composition. To ensure that the job opportunities created are equally accessible to new entrants, individuals underrepresented in the construction industry, and workers from disadvantaged and under-resourced communities, DOE will, in partnership with DOL, establish targets for apprentice utilization and will employ a place-based community engagement approach to identify additional opportunities to reduce barriers to energy-sector employment. The DOE reporting tools also supports this goal by tracking apprentices to include certification requirements.

Invest in community and labor engagement to improve the quality of and access to jobs in new manufacturing opportunities

In addition to construction activity, a renewed emphasis on industrial development and developing domestic supply chains will grow jobs in the manufacturing sector. Expanding manufacturing jobs will increase rippling economic effects (including indirect and induced jobs, tax revenue, etc.) of deployment investments. Growing new manufacturing industries in the U.S. will require coordinated, industry-wide workforce development activities that grow skills and improve retention of workers in the industry. Since industrial revitalization brings work and local

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which assist construction projects through grants, loans, loan guarantees, and insurance. These "related Acts" involve construction in such areas as transportation, housing, air and water pollution reduction, and health. If a construction project is funded or assisted under more than one Federal statute, the Davis-Bacon prevailing wage provisions may apply to the project if any of the applicable statutes requires payment of Davis-Bacon wage rates.

wealth-building opportunities, as well as environmental justice challenges for frontline communities, community engagement will be essential to the success of DOE's efforts to grow manufacturing jobs and support place-based economic development and diversification.

DOE will also partner with state and local organizations to significantly accelerate the deployment of clean energy technologies and practices through place-based strategies involving a wide range of government, community, labor, and business stakeholders. These activities help decrease energy costs and contribute to decarbonization efforts, provide good-paying jobs with a fair and free choice to join a union and collectively bargain, and secure clean energy economy benefits for all Americans, especially marginalized and low-income communities that have long borne the brunt of pollution.

Foster U.S. competitive advantage based on high-road and responsible industry aligned with our economic, job creation, and export goals

DOE's direct demonstration and deployment activities could support the creation of a significant number of jobs across the U.S. over the next few years, but to truly be successful creating large-scale permanent employment opportunities in the energy and related sectors, DOE will leverage tools other than deployment. De-risking private investment in new technologies, supporting the expansion of domestic manufacturing, leveraging the procurement power of the federal government, reducing non-hardware costs, and other levers can be used to support and enlist private-sector partners. DOE can enhance U.S. competitive advantage, through funding opportunities, pilots, demonstration projects, and other activities that foster and support the development of a highly skilled and trained workforce, low-carbon products and materials, low-carbon intensity industrial processes, and responsible resource extraction and utilization. DOE will develop an agency-wide process to demonstrate the highest possible social and environmental responsibility in its activities. The international market value associated with implementation of countries' commitments under the Paris Agreement is immense, offering an historic wealth creation opportunity that the U.S. must position itself to seize. DOE will work with interagency partners, including through the National Export Strategy, to leverage international markets to increase clean energy technology and service exports to sustain U.S. competitiveness and jobs.

Performance Goals

To be tracked using labor compliance software and reported annually

- Increase employment of women in the energy sector from 25% to 35%. Increase employment of Black or African American workers in the energy sector to equal representation as U.S. Workforce (11% to 14%). Individuals from disadvantaged communities will perform at least 40% of total construction hours on DOE grant-funded Davis Bacon projects.
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- Minimum of 15% apprentice utilization, measured by hours worked on DOE deployment projects. This is the same ratio as is required in the Inflation Reduction Act.

- As a measure of job quality, total annual contributions to employee health insurance and retirement accounts, attributable to DOE deployment projects.
- 20 percent of large ($35+ million) demonstration and deployment projects will have negotiated Project Labor Agreement (PLA).
- Proposals that include partnerships with or support from labor unions will be prioritized in funding criteria.
- Starting wages on DOE-funded BIL and IRA projects will be above average for the respective industry and increased mobilization of clean energy private capital in J40 communities. The industry is determined as the closest North American Industry Classification System (NAICS) code for the project awarded funding.

Goal 2: Strengthen the Nation's Energy Security, Resiliency, Affordability, and Reliability

The U.S. energy system faces an unprecedented and evolving threat landscape. Energy infrastructure and the digital supply chain are a key target for cyber compromise. Communities nationwide are experiencing the impacts of a changing climate and increasing natural hazards, such as wildfires and hurricanes. Pandemics and other biological threats, cyberattacks, climate shocks and extreme weather events, terrorist attacks, geopolitical and economic competition, and other conditions can reduce critical manufacturing capacity and the availability and integrity of critical goods, products, and services. The cyber threats to critical energy infrastructure are among the most significant issues confronting the Nation, and a successful attack on critical energy infrastructure could cause significant harm to national and economic security. At the same time, technology innovation and increasing grid connectivity are rapidly changing the risk posture, and these trends have been accelerated by the global pandemic.

This is all happening as communities nationwide are experiencing the impacts of a changing climate and increasing natural hazards, such as wildfires and hurricanes, which have affected millions of people in the United States. In 2021 alone, the National Oceanic and Atmospheric Administration (NOAA) reported that 18 weather/climate disaster events exceeded losses of $1 billion (each), costing the economy $104.8 billion in economic loss in total.[5] These disasters disproportionately affect communities of color who are more likely to live in vulnerable areas and without access to air conditioning, heat, and other critical services. Recent extreme weather events make it clear that the Nation's existing energy infrastructure may not endure the impacts of climate change.

The Administration has taken swift and extensive action to manage these rising and dynamic threats. With the implementation of the Infrastructure Investment and Jobs Act (IIJA), DOE will make the largest investment in the resilience of physical and natural infrastructure in American history. Funding will be used to upgrade and modernize the energy system, improving resilience to extreme weather and resistance to cyberattack. DOE will harden infrastructure through technical assistance and grant programs, advance cybersecurity research, enhance threat modeling and detection capabilities, test the cybersecurity of products and technologies intended for use in the energy sector, and increase supply chain resilience. IIJA targets environmental justice and clean energy manufacturing, ensuring the U.S. can grow domestic industries and provide Americans with good-paying jobs, and making sure no community is left behind.

DOE will execute the provisions in the IIJA building on President Biden's cyber and supply chain resilience measures. In April 2021, the Biden Administration launched an Industrial Control Systems Cybersecurity Initiative to strengthen the cybersecurity of critical infrastructure across the United States. The initiative began with a 100-Day Action Plan for the U.S. electricity subsector led by the DOE's Office of Cybersecurity, Energy Security, and Emergency Response

[5] NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2021). https://www.ncdc.noaa.gov/billions/, DOI: 10.25921/stkw-7w73

(CESER) in close coordination with the U.S. Department of Homeland Security's Cybersecurity and Infrastructure Security Agency (CISA), and the Electricity Subsector Coordinating Council (ESCC). On July 28, 2021, President Biden further emphasized the importance of this initiative and broader cybersecurity efforts through his National Security Memorandum on Improving Cybersecurity for Critical Infrastructure Control Systems. By the end of 2021, more than 150 utilities committed to adopting technologies to provide better detection, monitoring, and response capabilities. Building on these directives, DOE will continue to expand threat information sharing across industry and government and improve technologies aimed at enhancing cybersecurity.

Through Executive Order 14017, "America's Supply Chains," President Biden identified the need for resilient, diverse, and secure supply chains to ensure U.S. economic prosperity and national security. The Executive Order directed the Department to identify risks in the supply chain for high-capacity batteries, including electric-vehicle batteries, and policy recommendations to address these risks, and to submit a report on supply chains for the energy sector industrial base. Pandemics and other biological threats, cyberattacks, climate shocks and extreme weather events, physical attacks, geopolitical and economic competition, and other conditions can reduce critical manufacturing capacity and the availability and integrity of critical goods, products, and services. DOE's analysis will guide improvements to energy supply chain resilience, revitalize and rebuild domestic manufacturing capacity for the energy sector, and bolster energy security and independence.

Each of DOE's objectives within this goal are aimed at fulfilling the mission to keep America on track to reducing emissions and deploying the technology and infrastructure necessary to achieve net-zero emissions no later than 2050.

Power system decarbonization modeling suggests that the U.S. will need ~550 – 770 GW of additional clean, firm capacity to reach net-zero emissions. Nuclear power is one of the few proven options that could deliver this at scale. Advanced nuclear can play a critical role in strengthening energy security, reliability, and affordability while facilitating an equitable energy transition. However, resolving the spent nuclear fuel disposition challenge is critical to enable the revitalization of the U.S. nuclear industry. By pursuing federal consolidated interim storage for spent nuclear fuel, the Department can demonstrate credibility in managing the back-end of the nuclear fuel cycle, provide a near-term, temporary solution for the more than 90,000 metric tons of spent nuclear fuel stored at more than 70 sites, and ultimately ease the burden on U.S. taxpayers.

Strategic Objective 5 – Develop and deploy innovative solutions to harden energy infrastructure against physical threats including climate change

Objective Leader(s)

- Under Secretary for Infrastructure
- Under Secretary for Science and Innovation

Contributing Program(s)

- Electricity
- Cybersecurity, Energy Security, and Emergency Response
- Policy
- Intelligence and Counterintelligence
- Clean Energy Demonstrations
- Manufacturing and Energy Supply Chains
- Grid Deployment Office
- Loan Programs Office
- Power Marketing Administrations
- State and Community Energy Programs
- Federal Energy Management Program

Expand the electric grid to meet clean energy and electrification goals

Expanding and modernizing the energy system will make it more resilient, while enabling the buildout of affordable, reliable, clean energy to support President Biden's goal of 100% carbon-pollution free electricity by 2035 and net zero emissions economy-wide by 2050. Electrification increases the importance and criticality of the electricity infrastructure. The focus should be on developing nationally significant transmission lines, increasing resilience by connecting regions of the country, installing clean firm generation sources, and improving access to energy efficiency and cheaper clean energy generation sources.

Through the Building a Better Grid Initiative, DOE works to modernize and upgrade the Nation's power sector, deploying cost-effective, cleaner, reliable, and more resilient electricity delivery technologies to benefit all communities. With a strong commitment to collaboration, the Grid Deployment Office (GDO) brings together communities and industry stakeholders to identify national transmission and distribution needs. Within the Department, GDO takes a holistic view of the electricity system by closely collaborating with the Offices of Electricity, Energy Efficiency and Renewable Energy, Clean Energy Demonstrations, Cybersecurity Energy Security and Emergency Response, Power Marketing Administrations, and others.

GDO activities supports four key priorities:

- Planning – modernize distribution and transmission planning processes to drive the development of highest-need grid projects that provide largest long-term benefits to consumers.

- Financing – deploy IIJA and IRA authorities and coordinate existing financial tools within the Department to help accelerate interregional transmission builds and enhance the resilience of the grid.

- Permitting – coordinate with States and Federal permitting agencies to help facilitate and streamline siting and permitting processes.

- Coordination – early, frequent, and collaborative engagement with government entities, including States, Territories, American Indian Tribes, and Alaska Natives, and other stakeholders throughout the process of evaluating needed transmission and distribution infrastructure to meet energy goals and deploying the Department's tools and authorities to accelerate the infrastructure deployment, integrating energy justice principles.

Upgrade existing transmission and distribution systems to build flexibility and incorporate clean resources

Improve the flexibility of the grid and enable the grid to accommodate a new energy future with distributed generation and microgrids where families and businesses can generate their own clean energy. DOE will develop, demonstrate, and institute approaches for addressing grid flexibility needs through the application of energy storage; and enable flexible generation and demand including through, but not limited to, real-time adaptive response capabilities in grid operations utilizing artificial intelligence capabilities.

De-risk the deployment of clean, firm energy generation capacity

To achieve net-zero emissions goals by 2050, approximately 550-770 GW of clean, firm energy generation will be needed. Variable renewables alone cannot provide a secure and reliable energy supply to meet economic and energy justice goals. Firm energy generation includes advanced nuclear, variable renewables paired with long-duration energy storage, fossil generation paired with carbon management technology, and clean hydrogen production to decarbonize non-electric industrial applications. To make progress toward this 2050 goal, DOE must utilize existing authorities and resources to incentivize rapid commercialization of long duration energy storage, carbon mitigation technologies, advanced nuclear reactors, clean hydrogen, and other clean, firm generation capacity.

Work with states and localities to develop energy security planning efforts that incorporate climate and resilience strategies

Enhancing resilience will require a whole-systems approach to address vulnerabilities across community, state, and regional jurisdictions. State and local policymakers are actively exploring and adopting energy policies to encourage innovation, fairness and equity, energy economic development, and energy efficiency, all of which have energy security and cybersecurity implications. DOE will enhance its support to states, localities, and other stakeholders to develop resilience strategies including energy security and preparedness efforts to reduce risk and vulnerabilities and adapt to climate change. This will require coordination of grid planning and

operations across jurisdictions to include the consideration of alternative grid configurations, such as mini-grids and micro-grids, to sustain critical functions during emergencies and to prevent or minimize exposure to long-lasting outages.

Characterize and prioritize risks in the energy sector

As the Sector Risk Management Agency for the energy sector, DOE will continue to improve the understanding of risk and the interdependencies with other critical infrastructure sectors, and develop actionable mitigation measures, guidance, and cost-sharing pilots with the aim of managing risk, reducing the impact of disruption, and informing policy and investment decision-making. DOE will establish formal mechanisms for incorporating threat-based, risk analysis methodology within grid planning processes to enable the identification and prioritization of options resulting in the formulation of resilience strategies within communities, states, and regions.

Develop Tools and Technologies to address impacts from extreme weather, seismic, and EMP/GMD risks.

As directed by Executive Order 13865 and the National Defense Authorization Act of 2020, DOE continues to work to conduct: basic research, modeling and simulations, vulnerability testing, illustrative site and broader infrastructure risk assessments, mitigation theory development, mitigation research and development, near commercialization mitigation pilot projects, benchmark development and updates, essential inter-agency coordination as directed over the next decade, and industry engagement to secure the energy sector from the natural hazards associated with solar weather and contingencies where nuclear weapons explode high in the atmosphere above the United States.

Given the upturn in frequency and consequence of physical attacks over the recent years, on the energy sector DOE will continue and intends to, contingent on funding availability expand physical security research and development, industry and regulator engagement, threat intelligence engagement to understand trends and monitor for emerging threats, facilitate tailored sector security investments, and expand cooperation with law enforcement to improve future energy sector post-physical attack forensics.

In September 2022, CESER-RMTT established a Climate Effects Program that would focus on extreme weather and seismic risks to energy infrastructure. The vision of this program is to develop a program that advances state-of-the-art technologies that assist utilities in establishing a level of robustness prior to extreme weather or seismic events, provides a resourcefulness during these events, accelerates the ability for rapid recovery following an event, and provides the adaptability to future events.

Performance Goals

- Lead SRMA engagement activities, facilitating information sharing, policy development, and risk management activities with the critical infrastructure stakeholders and interagency.

- Develop new and build on existing capabilities to identify critical energy companies (e.g., electricity, oil, natural gas, and distributed energy resources) in the U.S. and perform intelligence-informed risk analysis, in close coordination with other DOE offices and through the National Labs, as well as in coordination with other Federal agencies and critical infrastructure sectors.
- Develop analytic capabilities that can dynamically identify and prioritize energy infrastructure in support of Defense Critical Energy Infrastructure.
- Identify and/or assess resilience options that could be implemented to accomplish DOE and Administration strategic goals on securing energy delivery systems from all hazards. Facilitate communication of those options through the development of Analysis of Risk for Energy Systems (ARES) reports and other risk analysis products and communication tools.
- Develop new HEMP/GMD modeling codes for to be made available to national laboratories; Federal, State, and Local Energy regulators; Utility owner and operators and US manufacturers to improve bulk power system modeling on an interconnect scale; and to update and use those codes to develop new protective insights.
- Produce vulnerability testing and assessment reports to underwrite our assessments, improve our modeling capabilities and close critical gaps from new technology development.
- Advance the technology readiness levels of vulnerability mitigation from pure theoretical research to near commercialization activities.
- Improve deterrence for attacks against energy infrastructure by supporting new technology deployments focused on post-attack forensic capabilities, in close coordination with utilities and law enforcement.
- Develop new opportunities for national laboratory research and development to spur new ideas to improve energy sector security against man-made non-cyber threats in terms of effectiveness and cost, and deal with emerging threats.
- Establish a forum, focused on electric utilities, that will assist preparing the workforce for future climate effects and events. Use the group for feedback on research.
- Identify strengths and weaknesses of the current grid regarding extreme natural events, develop and demonstrate tools and technologies to mitigate identified weaknesses.
- Develop and demonstrate tools and technologies that improve situational awareness and safety during extreme natural events.
- Develop and demonstrate tools and technologies that lessen outages and shorten recovery time due to extreme natural events. Develop methods of sharing calculated climate data with utilities that will assist in developing engineering standards.
- Develop tools that directly evaluate wildfire ignition sources, situational awareness, and smoke/soot impacts on grid equipment and solar output.
- Evaluate seismic effects on grid components and develop functional models of known seismic areas and the consequences to the grid based on grid component impacts.
- Develop drone tools, technologies that improve efficiency of pre/post inspections regarding extreme natural events.
- Better identify and reduce federal facility fiscal risk to current and future climate effects and events through incorporating climate risks in Vulnerability Assessment and Resilience

Planning (VARP) methodology, advancing DOE site resilience and needed capabilities, and providing additional assistance for federal facility resilience through the Federal Energy Management Program.

Strategic Objective 6 – Advance adoption of solutions to prevent and respond to cyber vulnerabilities and incidents

Objective Leader(s)

- Under Secretary for Infrastructure
- Under Secretary for Science and Innovation

Contributing Program(s)

- Cybersecurity, Energy Security, and Emergency Response
- State and Community Energy Programs
- Energy Efficiency & Renewable Energy
- Fossil Energy and Carbon Management
- National Nuclear Security Administration
- Intelligence and Counterintelligence

Improve visibility of threats and enhance cyber threat information sharing with the energy sector

Encourage adoption of technologies that will improve visibility of threats to energy sector infrastructure and enhance threat detection, mitigation, and response. Share and bring actionable cyber threat intelligence to sector partners to increase awareness of emerging cyber threats, enhance operational coordination in cyber among government and industry, and provide technical expertise to develop and test cyber mitigation approaches.

Work with states, localities, and other stakeholders to develop energy security planning efforts that incorporate cyber security strategies

DOE will work with states, localities, and other stakeholders to develop resilience strategies including energy security planning and preparedness efforts to reduce vulnerabilities.

Strengthen the Department's ability to respond to cyber incidents

Continue to enhance the Department's ability to respond to cyber incidents in the energy sector and across the DOE enterprise by strengthening cybersecurity and cyber response capabilities and leveraging Departmental and National Laboratory expertise. Continue to refine cyber incident response processes and procedures across DOE and in coordination with Federal, industry, and state partners.

Enhance energy and cyber security of electric vehicle charging infrastructure, and clean energy research, development, and innovation efforts

Coordinate across the DOE applied technology offices and competitively fund strategic research and development that leverages National Lab capabilities and industry innovations to revolutionize cyber systems and capabilities. Meet joint government and energy sector needs and

target novel technology development beyond today's challenges, focusing investment both on near-term goals that allow for demonstration of products and services needed by owners and operators, vendors, and manufacturers now, and long-term goals of the future energy system.

Performance Goals

- Coordinate with Vehicle Technologies Office (VTO), the Joint Office of Energy and Transportation (JO), Vehicle Grid Integration (VGI) partners, and other federal stakeholders to develop RD&D of the cybersecurity tools and technologies needed for the future state secure attributes needed in the EV/EVSE ecosystem.
- Develop customizable energy security and cybersecurity resources, tailorable to local energy security needs for the anticipated over 200 local and tribal governments will develop plans utilizing these tailored resources.
- Prepare States to build-in security from the start with guidance, procurement language examples and facilitated collaboration across State agencies to enable coordination and process changes that are required to accomplish the secure clean energy transition. DOE anticipates 30 states and territories will adopt security guidelines based on direct CESER assistance and uptake of previous offerings.
- Deliver CESER's CyberForce Competition, a collegiate cyber defense competition in which students defend a simulated cyber-physical infrastructure against professional red-team attackers, bringing together energy sector industry and government partners with hiring priorities and the nation's future cybersecurity defenders.
- Develop and deliver cybersecurity training to the energy sector, federal, and SLTT partners through hands-on training efforts such as its CyberStrike Training program and the Operational Technology (OT) Defender Fellowship, to further reduce the consequences of cyber-enabled sabotage.
- Establish new coordination and relationship-building opportunities to identify and eliminate barriers to energy security information sharing across governments and industry, including for renewable and distributed energy resources (DERs). This includes developing immediate risk and resilience analyses and actions to mitigate the impacts of energy supply disruptions. These products will address key knowledge gaps to improve stakeholder capacity to develop and implement policies, regulations, and training programs that support incorporating critical energy security, cyber security, and resilience into infrastructure systems. Partner with industry to continue the development of the Energy Threat Analysis Center (ETAC) pilot capabilities to enhance information sharing and the development of mitigation strategies to address threats and hazards to the energy sector.

Strategic Objective 7 – Secure the supply chain for a robust clean energy transition

Objective Leader(s)

- Under Secretary for Infrastructure
- Under Secretary for Science and Innovation
- Executive Director for Office of Policy

Contributing Program(s)

- Electricity
- Cybersecurity, Energy Security, and Emergency Response
- Policy
- International Affairs
- Energy Efficiency & Renewable Energy
- Fossil Energy and Carbon Management
- National Nuclear Security Administration
- Nuclear Energy
- Intelligence and Counterintelligence
- Manufacturing and Energy Supply Chains
- Loan Programs Office

Enable advanced grid technologies by enhancing the supply chain of critical materials

Expand grid-scale energy storage and support a resilient domestic industrial base for grid hardware. MESC is responsible for strengthening and securing manufacturing and energy supply chains needed to modernize the Nation's energy infrastructure and support a clean and equitable energy transition. MESC catalyzes the development of an energy sector industrial base through investments that establish and secure domestic clean energy supply chains and manufacturing, and by engaging with private-sector companies, other Federal agencies, and key stakeholders to collect, analyze, respond to, and share data about energy supply chains to inform future decision making and investment.

Implement the recommendations of the Energy Sector Industrial Base report

Under the President's "America's Supply Chains" Executive Order, DOE will implement the recommendations to improve energy supply chain resilience, revitalize and rebuild domestic manufacturing capacity for the energy sector, and advance the fight against climate change.

Expand threat and vulnerabilities testing

Establish the Energy Cyber Sense program to build on existing cybersecurity testing of products and technologies used in the bulk power system. Energy Cyber Sense will encompass DOE's cyber supply chain efforts, including testing and enumeration, frameworks for delineating the software and hardware in energy components, and cybersecurity solutions for the Nation's clean energy grid of the future.

Performance Goals

- Identify cross-cutting energy supply chain vulnerabilities and embed in DOE program priorities.
- Incorporate cybersecurity supply chain recommendations into the Energy Cyber Sense program.
- By 2024, establish international collaboration options to coordinate supply chain security for low-enriched uranium across our peaceful, trusted allies.
- By 2025, establish contracts to incentivize the domestic commercial market to produce up to 25 metric tons per year of high-assay, low-enriched uranium (HALEU) as soon as possible.

Strategic Objective 8 – Support an effective emergency response capability in the federal government for responding to critical energy events

Objective Leader(s)

- Under Secretary for Infrastructure

Contributing Program(s)

- Fossil Energy and Carbon Management
- National Nuclear Security Administration
- Nuclear Energy
- Cybersecurity, Energy Security, and Emergency Response
- Petroleum Reserves
- Intelligence and Counterintelligence

Strengthen the effectiveness of Department of Energy incident management capabilities to address an evolving threat landscape

DOE will collaborate with industry partners, state, local, Tribal, and territorial governments, and other Federal agencies – offering energy experts as part of the government-wide approach to incident management and response – whether the incident results from natural or manmade causes, is complex or crude, or cyber or physical. Such collaboration will better enable the Department to conduct regional emergency response preparedness exercises, revealing gaps and lessons learned. DOE will increase the functionality of the Energy Resilience and Operational Center, enhance its predictive modeling capabilities of risks and vulnerabilities to energy infrastructure, and improve its situational awareness through analysis and visualization capability.

Manage the Strategic Petroleum Reserve and be prepared to respond to petroleum market supply disruption

The Strategic Petroleum Reserve (SPR) benefits the Nation by providing an insurance policy against actual and potential interruptions in U.S. petroleum supplies caused by market disruptions including international turmoil, natural events, accidents, or terrorist activities. The SPR will implement the Life Extension Phase 2 (LE2) project designed to replace, repair, and upgrade critical SPR infrastructure. The project uses $1.4 billion in funds raised by selling SPR crude oil through Congressional authorization and is expected to be completed in fiscal year (FY) 2025. The SPR helps the United States meet its stockholding obligations as a member of the International Energy Agency (IEA). IEA members are required to maintain 90 days of total petroleum net imports in strategic stocks and participate with other stockholding nations in a coordinated release of stocks in the event of a major supply disruption.

Performance Goals

- Ensure operational readiness of the SPR by achieving 95% of monthly maintenance and accessibility goals in all years and maintaining the capability to drawdown at a 4.4 million barrels/day rate.
- Recruit, train and coordinate volunteer emergency responders from across DOE to maintain a minimum responder cadre of 100 to support multiple, simultaneous, or back-to-back incidents in an all-hazards environment]
- Provide actionable situational awareness to our interagency, SLTT, and industry partners through continuous monitoring and analysis of threats and incidents affecting or potentially impacting U.S. energy systems, including cyber threats.
- Develop situational awareness tools and products that assist our interagency, SLTT, and industry partners to enhance the capacity to manage risks, mitigate threats, and prepare and respond to emergencies.
- Scale cybersecurity training for operational technology and industrial control systems by increasing CyberStrike deliveries and enhance the renewable variation.
- Increase tools and capabilities for training and exercise programs for community-owned utility responders and help public power utilities create strategic plans to mitigate risk, enhancing emergency preparedness and response, while informing states' regulatory policies and investment decisions affecting the nation's critical utility infrastructure and updating, streamlining, and operationalizing state energy security plans. .

Strategic Objective 9 – Implement consolidated interim storage for the Nation's spent nuclear fuel

Objective Leader(s)

- Under Secretary for Science and Innovation

Contributing Program(s)

- Nuclear Energy
- Environmental Management
- Economic Impact and Diversity

The Department, through the Office of Nuclear Energy (NE), is responsible for management of the disposal of spent nuclear fuel (SNF) from more than 70 commercial nuclear power plants as well as disposal of DOE-owned SNF and high-level radioactive waste currently stored at 6 DOE sites, as well as research and development locations (e.g., university research reactors, other government agencies, etc.) across the continental U.S. As of 2020 there are 89,065 metric tons of heavy metal (MTHM) of SNF (both commercial and DOE-managed) and equivalent of and 10,500 MTHM of high-level radioactive waste; most of the material is currently stored at the sites where it was generated.

DOE is committed to meeting its obligations with respect to these responsibilities and will begin with a process to site a consolidated interim storage facility. Several core principles and guiding values underpin the development of this policy, including a commitment to protect public health and safety and the environment, prioritize environmental justice and social equity, focus on communities, enable broad participation, and work to build and sustain public trust and confidence. Therefore, a consent-based approach to siting is a key element of DOE's approach in accordance with key presidential directives on environmental justice and equity. These directives include Executive Order 12898 on "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," Executive Order 13985 on "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government," and Executive Order 14008 on "Tackling the Climate Crisis at Home and Abroad." Because a consent-based siting process, by its nature, must be flexible, iterative, adaptive, and responsive to community concerns, the Department will continue refining the process as it learns more.

Consolidated interim storage will enable near-term consolidation and temporary storage of spent nuclear fuel. This will allow for removal of spent nuclear fuel from reactor sites, provide useful research opportunities, and build trust and confidence with stakeholders and the public by demonstrating a consent-based approach to siting nuclear waste management facilities. In the Consolidated Appropriations Act, 2021, Congress appropriated funds to the Department for interim storage activities and requested that the Department move forward under existing authority to identify sites for federal interim storage facilities using a consent-based process.

NE coordinates with other Department program offices, such as the Office of Economic Impact and Diversity (ED) to ensure DOE's approach to consent-based siting for consolidated interim

storage facilities includes social equity and environmental justice considerations; and the Office of Environmental Management (EM) for considerations on storage and disposal of DOE-managed SNF and HLW.

Initiate a Consent-based Siting Process

NE is utilizing lessons learned and best practices gleaned from successful and unsuccessful, domestic and international nuclear waste facility siting activities to continue development of a consent-based siting process for federal consolidated interim storage facilities.

To conduct this work, NE is building a team of federal and laboratory personnel with broad-ranging expertise in engineering and physical sciences, social sciences, communications, and environmental justice. Several National Laboratories, including Pacific Northwest National Laboratory, are providing key support to this effort.

Performance Goals

- Continue development of a phased and adaptive consent-based siting process that is voluntary and will provide interested communities opportunities to learn, consider, and eventually decide if they are interested in volunteering to host an interim storage facility.
- Engage with relevant Tribal, state and local governments, general public, and DOE stakeholders in FY 2024 to solicit feedback from interested communities, groups, industry, and others.
- Continue engagement with communities and interested groups in FY 2023–2026 through a consent-based siting process.
- Continue to hire new Federal staff in FY 2022-2026 in technical areas, social sciences, and communications relevant to nuclear waste management, storage, and disposition (including disposal).
- Complete fabrication and testing of purpose-built railcars in FY 2023–2026.
- Commence full-scale physical accident testing of a rail-sized SNF transportation cask in FY 2026.
- Continue working with State and Tribal partners to address outstanding operational and policy questions related to future DOE large-scale transport of commercial spent nuclear fuel.
- Continue ongoing research and development on nuclear waste storage and disposal including analysis and monitoring of the high-burnup fuel storage test; testing salt deposition and corrosion of stainless-steel canisters; and developing test plans for evaluating characteristics of accident tolerant and advanced reactor fuels in storage, transportation, and disposal.

Goal 3: Advance Scientific Discovery and National Laboratory Innovation

Leadership in science and innovation is critical to America's security and prosperity. DOE will advance the Nation's pre-eminence in scientific discovery and technology innovation through support for cutting-edge basic research, global leadership in emerging technology areas, and partnership with the private sector and partner countries to transition new discoveries to deployable technologies in fields of strategic importance. The foundation of these efforts will continue to be the stewardship of the National Laboratories and the development and operation of a suite of world-class facilities for research and training the next generation of diverse, skilled scientists and engineers.

DOE manages a portfolio of basic research that underlies revolutionary energy breakthroughs, seeks to unravel nature's deepest mysteries, and provides the Nation's researchers with the most advanced large-scale tools of modern science. DOE excels in the use of multi-disciplinary, multi-institutional research teams to address highly complex science and technology challenges, leveraging some of the most advanced scientific instruments in the world. The interconnectedness of the DOE research community, particularly the 17 National Laboratories, is a competitive advantage to the Nation, both for pushing the frontier of knowledge, and also for responding rapidly to national and international crises. DOE harnesses its scientific prowess to maintain or achieve global leadership in key innovation and national security technology areas, including clean energy technologies, artificial intelligence, quantum information sciences, microelectronics, advanced computing, particle accelerator technologies, and next generation biology. DOE also focuses efforts on improving the navigation of the research, development, demonstration & deployment (RDD&D) continuum by addressing barriers and gaps that impede commercialization.

Strategic Objective 10 – Advance basic scientific understanding and identify new methods and tools to further discovery

Objective Leader(s)

- Under Secretary for Science and Innovation
- Under Secretary for Nuclear Security

Contributing Program(s)

- Science
- National Nuclear Security Administration
- Nuclear Energy

Basic and use-inspired scientific discoveries are essential fuel for future technology innovations. When leveraged with Department-wide scale and coordination across lines of effort, the impact of these discoveries is dramatically amplified. As the federal agency funding the largest share of basic research in the physical sciences, DOE will continue to pursue scientific discoveries at its National Laboratories, and in partnership with universities, and industry that lay the scientific foundation to extend our understanding of nature and create new technologies that support DOE's energy, security, and environmental stewardship missions.

DOE plays a unique role in the Nation's science enterprise through its investments in, and operation of, unique, world-leading open access scientific user facilities, including accelerators, high-performance computers, x-ray light sources, test reactors, and neutron sources, as well as multidisciplinary-enabling facilities in nanoscience and environmental and biological research. Tens of thousands of scientists from the National Laboratories, U.S. universities, private companies, and other federal agencies use these extraordinary facilities each year to advance the frontiers of knowledge and develop new technologies. These accomplishments advance not only DOE's core energy missions, but also the missions of other federal science and technology agencies. This far-reaching scope in the work conducted by researchers at the National Laboratories accrues extraordinary benefit to the Department by broadening the scientific and technical expertise in the DOE complex and enabling development of new tools and techniques for discovery that are applied back to DOE's core mission areas.

Conduct discovery-focused research to advance our understanding of matter, materials, and their properties

As has been demonstrated over DOE's history, the pursuit of scientific discovery yields rich insights and technology innovations that have the potential to drive societal transformation. Basic and use-inspired science is the foundation of DOE's missions in energy, security, and environmental stewardship, and an important driver for the development of the technologies that will support the Nation's economic and national security far into the future.

The Department will continue to concentrate its efforts in advanced scientific computing, materials and chemical sciences, biological and environmental sciences, fusion energy sciences, high energy physics, and nuclear physics. Support for these core science areas contributes to

advancing our ability to analyze, model, simulate, and predict complex phenomena, control matter and energy to enable development of novel energy and transformative manufacturing technologies, develop a predictive understanding of complex biological and earth systems, understand and control matter at very high temperatures and densities, answer questions about the origin and composition of our universe, and create and describe the many forms and complexities of nuclear matter. The advances that are derived from the Department's support for research in these areas address the most substantial challenges of our time, including understanding and predicting the role that humans are playing in a changing climate, developing entirely new energy technologies needed to meet our future needs while simultaneously drawing down our emissions of heat-trapping gasses, enabling transformational energy storage systems, and developing resilient and secure supply chains for rare-earth metals and other materials.

Scientific discovery remains essential for ensuring that the Nation's nuclear stockpile remains viable into the future without underground nuclear explosive testing. The Department will continue to pursue a portfolio of basic theoretical and experimental research across the DOE complex and at U.S. universities that will advance our understanding of the physics of nuclear weapons and lead to the development of more advanced tools. Such work will also contribute to furthering the Department's broader goals in the development of future energy technologies that can contribute to reducing the Nation's reliance on fossil-derived fuels.

Capabilities developed and maintained in NNSA support the entire nuclear security enterprise in meeting Department of Defense requirements by providing: (1) the scientific underpinnings required to conduct annual assessments of weapon performance and certification of life extension programs, (2) the scientific insight necessary to inform our understanding of the impacts of surveillance findings to assure that the nuclear stockpile remains safe, secure, and effective, and (3) the core technical expertise required to be responsive to technical developments and geopolitical drivers.

Performance Goals

- FY 2022–2026, advance understanding of matter and energy at the electronic, atomic, and molecular levels.
- FY 2022–2026, advance the understanding, manipulation of and design of biological systems for new clean energy technologies, and develop multiscale, earth systems models to monitor, assess and predict climate impacts under a changing global economy.
- FY 2022–2026, advance status of developing optimum scenarios for achieving high-performance plasmas in burning plasma devices.
- FY 2022–2026, advance status of experiments to test the standard model.
- FY 2022–2026, significantly advance understanding of the limits of the existence of nuclei, and the origin of heavy elements.
- FY 2022–2026, advance the reaches of science and engineering through unprecedented computing capabilities at the intersection of exascale simulations, massive scientific data, and scientific machine learning.
- FY 2022–2026, develop increased domestic production capacity and new isotope supply chains of critical isotopes in short supply for medical, national security, industrial, and

research applications.
- FY 2022–2026, maintain confidence in the nuclear stockpile in the absence of underground nuclear explosive testing with advancements in next-generation modeling and simulation capabilities and state of the art experimental diagnostics and facilities
- FY 2022–2026, develop in simulation and experimental capabilities that support deeper mechanistic understanding of nuclear weapons performance and safety.
- FY 2022–2026, access weapons-relevant physics regimes with experimental and simulation capability to better understand controlled thermonuclear fusion in support of stockpile science.
- FY 2022–2026, perform research to resolve two major remaining scientific challenges in understanding the performance of the deterrent: the properties of a thermonuclear burning plasma and the mesoscale behavior of materials in weapon relevant regimes using advanced pulsed power for high energy density experiments and from Light Source Facilities.

Provide the world's researchers with world-class scientific user facilities

Tens of thousands of scientists from the National Laboratories, universities, private companies, the international research community, and other federal agencies use DOE's extraordinary facilities each year to advance the frontiers of knowledge. These world-class scientific user facilities enable mission-focused research and advance scientific discovery. They also serve to attract the best and the brightest scientists from around the world to advance the U.S. research agenda. Advances in Artificial Intelligence/Machine Learning (AI/ML), automation, and high-throughput networking that have been enabled by sustained DOE investments are being leveraged by DOE facilities to create a new paradigm for scientific user facilities that can transform the conduct of science and accelerate the pace of discovery. Ensuring that current and future capabilities are available for researchers in the U.S. and internationally requires a best-in-class project management culture, and its high standards for the delivery of operating time to users.

Beyond the suite of scientific user facilities made available to the community based on the merit of proposed work, the Department supports the development and operation of a wide range of capabilities that are critical to RDD&D needed to advance the specific energy, security, and environmental stewardship missions. Many of these facilities also offer opportunities to the broader DOE research community to advance science and technology development. Such facilities and capabilities for nuclear energy technology including the Gateway for Accelerated Innovation in Nuclear (GAIN) Initiative, the National Reactor Innovation Center (NRIC), and the Nuclear Science User Facilities (NSUF) program, which utilize the facilities and expertise at the U.S. national laboratories and universities nationwide to help reactor developers improve technology readiness. The Department will continue to work across its core program elements to leverage its investments more significantly to the benefit of all its mission areas.

Performance Goals

- FY 2022–2026, DOE national scientific user facilities shall annually be available to users

at least 85% of their scheduled operating time.
- FY 2022–2026, cost and schedule variance from established baselines for Office of Science major construction, upgrade, or equipment procurement projects will be kept to less than 10%.
- FY 2022–2026, conduct R&D to develop the technologies and their associated industrial bases needed to enable transformative advances in accelerator technology necessary for progress in basic science and applied R&D.
- FY 2022–2026, create co-design partnerships to seamlessly create large-scale "ecosystems" of AI/ML-enabled facilities, self-driving experiments, infrastructures, and technologies that will transform science and energy research.
- FY 2025, complete the construction of the Advanced Manufacturing Collaborative Facility.
- FY 2022–2026, invest in new capabilities and world-class facilities that provide improved understanding of and unprecedented quality of information on phenomena important for stockpile science and stewardship, for example, a deeper understanding of plutonium aging.

Promote Open Science

DOE is committed to integrity and reproducibility in science. Where consistent with preserving the national and economic security interests of and commercialization impacts for the U.S., DOE will robustly support the open-science principles of transparency and reusability of its research products by providing access to scientific and technical publications, as well as unclassified scientific data and software developed from DOE-funded projects. This commitment to open science serves to increase the pace of scientific discovery and promote more efficient and effective use of government resources. The Department will seek to build on existing tools and apply modern approaches based on AI/ML and leading-edge data science principles to ensure the results of DOE-funded work can be more quickly identified and utilized by the community, and to enable greater understanding and more effective stewardship of its science and technology R&D portfolios and its community of performers by the Department.

Performance Goals

- FY 2022–2026, assign or collect persistent identifiers (PIDs) for ~40,000 DOE-funded research objects annually to make them more findable, accessible, interoperable, and reusable (FAIR) and to make AI technologies more transparent, reproducible, privacy-preserving, and trustworthy.
- FY 2022–2026, promote open science by developing AI/ML tools for enhancing metadata quality and discoverability for all of DOE's unclassified, publicly releasable R&D products.
- FY 2022–2026, conduct AI strategic portfolio alignment and optimization by tracking cross-cutting discovery, research, and applications, with insightful reporting and communications.

Strategic Objective 11 – Lead globally in key innovation and national security areas including clean energy technologies, artificial intelligence, quantum information sciences, microelectronics, advanced computing, particle accelerator technologies, and next generation biology.

Objective Leader(s)

- Under Secretary for Science and Innovation
- Under Secretary for Nuclear Security

Contributing Program(s)

- Science
- Energy Efficiency & Renewable Energy
- Fossil Energy and Carbon Management
- Nuclear Energy
- National Nuclear Security Administration
- Intelligence and Counterintelligence

Establishing and/or maintaining global leadership in emerging innovation areas, including clean energy technologies, artificial intelligence, quantum information sciences, microelectronics, advanced computing, particle accelerator technologies, and next generation biology is critical to sustaining U.S. national security and economic strength. Transformative advances in each of these domains will only be realized through a commitment to multi-disciplinary research. As the steward of one of the world's largest and most diverse research infrastructures for scientific discovery, the Department of Energy is uniquely positioned to accelerate and sustain progress in these emerging technology fields.

Performance Goals

- FY 2023-2026, as part of the Accelerate initiative, support use-inspired research that integrates novel concepts with approaches that address technical bottlenecks to hasten the transition of discoveries to applied research and, ultimately, to the marketplace.

Clean energy technology

A secure, sustainable clean energy future is critical to mitigate the climate and environmental impacts of energy generation/use, and to support DOE missions in energy, environment, and national security. This future depends on a vibrant innovation pipeline that fosters research, development, demonstration, and deployment of clean energy technologies. The Department will focus on driving this pipeline, from foundational scientific knowledge to the cost, efficiency, and decarbonization stretch goals of Energy Earthshots. All relevant resources of the Department will be brought to bear in closely coordinated efforts, from world-leading basic research and scientific user facility capabilities at the National Laboratories, to applied research, demonstration, and deployment projects stewarded by DOE energy technology offices.

Performance Goals

- FY 2022-2026, continue to provide capabilities at user facilities that serve the broad clean energy research and development communities, ensuring that these capabilities evolve to tackle the most challenging research required for barriers identified in the applied research and demonstration activities.
- FY 2023-2026, establish at least 10 multi-investigator, multi-disciplinary teams closely coordinated with the technology offices and focused on research challenges at the interface between basic and applied research for the six Energy Earthshot topics.

Facilitate Artificial Intelligence advancements and efficiencies

Artificial intelligence is a foundational technology that is disruptive and will drive decades of innovation – impacting the way we live, work, learn, discover, and communicate. DOE will develop cross-cutting AI/ML mission-related technologies that can rapidly extract knowledge from rich, complex, and multi-modal big data. The Department is focused on promoting responsible, trustworthy, and equitable artificial intelligence principles and advancements, including data, robotics, and emerging AI/ML capabilities, to increase awareness and understanding of AI/ML towards addressing mission requirements. DOE will coordinate and orchestrate cross-cutting responsible, trustworthy, and equitable AI/ML capabilities and outcomes, including AI/ML pilots, governance, strategy, workforce development and communications.

Performance Goals

- FY 2022–2026, advance foundational research to make AI/ML technologies more transparent, reproducible, privacy-preserving, and trustworthy, and establish benchmarks for determining when an AI/ML technology is sufficiently robust for use in mission-critical DOE applications.
- FY 2022–2026, advance cross-cutting DOE AI/ML governance, external and internal investments, processes, and efficiencies, through varying mechanisms, including pilot programs.
- FY 2022–2026, convene assemblies with DOE programs, National Laboratories, industry, academia, and government agencies including international partners to improve AI/ML skills and explore application of emerging AI/ML trends, research and discovery, market adoption, and international best practices.
- FY 2022–2026, increase the use of commercially available AI/ML hardware and further develop machine learning algorithms to support stockpile science simulation activities.
- FY 2022–2026, develop and field AI/ML technologies at National Laboratories, plants, and sites within the nuclear security enterprise to support stockpile stewardship.

Support development of Quantum Information Science applications

Quantum information science (QIS) is the use of exotic quantum physics effects to acquire, transmit, manipulate, or measure information and perform computations and simulations. Establishing and maintaining global QIS leadership will be critical to U.S. national security and economic strength, as the Nation faces strong competition from China, the European Union,

United Kingdom, Canada, Australia, and Japan in this emerging field. QIS research is still in early stages, marked by broad, deep challenges in fundamental science, technology, engineering, and workforce development. To meet these challenges, DOE will make the necessary investments to achieve our long-term goals in quantum computing, communication, sensing, and other QIS applications.

Performance Goals

- FY 2022–2026, support the advancement of the fundamental, multi-disciplinary science that underpins quantum computing, simulation, communication, and sensing.
- FY 2022–2026, create tools, equipment, instrumentation, and community resources that enable innovations across the entire QIS ecosystem.

Advance innovation in microelectronics

Microelectronics, and the computing and information technologies they enable, continue to transform scientific discovery, our economy, and our daily lives. The limits of current technology, as well as increasing competition from around the world, require significant new investments in foundational technologies for microelectronics. The need for even greater innovation in microelectronics and power electronics is critical for two areas in particular: high performance computers and the smart electricity grid. DOE will enhance and expand its leadership and investments in all aspects of fundamental R&D relevant to future electronics, computing, and power technologies. Pertinent areas include materials, chemistry, synthesis, fabrication, devices, computing systems, architectures, algorithms, and software.

Performance Goals

- FY 2022–2026, work to develop next-generation microelectronic technology through new materials, devices, and architectures in partnership with academic researchers and U.S. vendors to accelerate advances in computing performance to enable scientific discovery across DOE's missions.
- FY 2022–2026, upgrade microelectronics capabilities to support advanced innovation.

Work towards achieving the next generation of advanced computers and integrated computational and data infrastructure

The United States has long led the way in computing, dating back to the invention of the first computers and continuing with world-leading machines at our National Laboratories. DOE's leadership in developing and building the world's most powerful computers is instrumental for enabling emerging technologies. With cutting-edge experimental, observational, and high-performance computing and networking resources and user facilities, DOE stewards one of the world's largest and most powerful ecosystems of research infrastructures for scientific discovery. By accelerating progress in exascale computing and beyond, DOE will maintain American primacy in computing science and technology. This world-leading high performance computing program will bolster our national security by supporting the nuclear stockpile, while also

supporting the next generation of scientific breakthroughs not possible with today's petascale computing systems. In addition, DOE is able to leverage its world-class expertise in advanced computing and networking to achieve an integrated computational and data infrastructure that crosses disciplines, laboratories, and facilities, transforming the DOE National Laboratories into an open innovation ecosystem, while advancing all critical DOE research and national security missions.

Performance Goals

- By 2022, successfully run a subset of mission-related early science applications on one DOE exascale computer.
- By September 30, 2023, deploy two exascale computers at DOE National Laboratories and ensure that 50% of ECP Applications achieve performance targets on exascale hardware.
- FY 2023, complete the development of an Advanced Computing Roadmap for the Department based on the input received from industry stakeholders in response to a request for information and the NNSA sponsored National Academy study on post-exascale computing.
- FY 2022–2026, work towards achieving the DOE Integrated Research Infrastructure (IRI) vision to respond to exponential increases in data and to provide on-demand access to computing and data storage resources with new technologies, such as scientific machine learning, to help steer experimental design. The foundational element of the IRI effort will be established in a hub and spoke model via a competitive process; the Hub will host centralized resources and also enable high priority DOE mission applications at "Spoke" sites by deploying and orchestrating distributed infrastructure at the Spokes or other locations.
- FY 2023-2026, deliver the first NNSA exascale system, El Capitan, and pursue new validated integrated design codes to provide critical simulation capabilities for informing decision-making related to the sustainment of the nuclear stockpile.

Particle accelerator technology

Large particle accelerators serve as advanced tools to see and control matter, enabling the observation of events on the finest and shortest time scales for discovery science research in materials, nuclear physics, and high-energy physics. Mid-sized particle accelerators support the Nation's Stockpile Stewardship mission by providing time-resolved hydrodynamic studies of weapons components. In addition, DOE supports the technology development of smaller particle accelerators with broad industrial, medical, and security applications that vary from strengthening materials with ion implantation and non-destructive inspection of microelectronics; medical isotope production and 3D mapping of proteins; and inspection of cargo containers and detection of nuclear materials. Through more than a century of innovation, particle accelerators have advanced 27 orders of magnitude in intensity, 9 orders of magnitude in penetrating power, and can now resolve events of femtosecond duration.

The Office of Science and NNSA operate more than 20 world-leading accelerator-based

facilities, serving thousands of scientists in both basic science and national security activities. These facilities provide critical research capabilities and are supported by dozens of special-purpose test facilities to innovate and develop new accelerator technologies. Despite significant investment, the U.S. leadership position is facing increased competition, with offshore accelerator-based facilities significantly outnumbering U.S. facilities. Competition from facilities in Asia and Europe is drawing away scientists, increasing technical workforce shortages and weakening domestic accelerator technology suppliers. DOE must redouble its efforts to meet these challenges through investments in R&D, public-private partnerships to strengthen the supply chain, and the training of a diverse, skilled workforce.

Performance Goals

- FY 2022-2026, Support the operation and continuous upgrade of a world-leading suite of accelerator-based scientific instruments and facilities, and the construction of next-generation tools.
- FY 2022-2026, Support the advancement of fundamental, multi-disciplinary science needed to keep DOE's accelerator facilities at the forefront and to deploy innovative new technologies as the foundation of next-generation facilities.
- FY 2022-2026, Strengthen U.S. manufacturing capabilities in critical particle accelerator technologies by supporting a growing portfolio of public-private partnerships that engage DOE National Laboratories, academia, and U.S. industry.
- FY 2022-2026, Strengthen the aging U.S. particle accelerator technical workforce through traineeships, R&D opportunities, and early career development opportunities intentionally designed to draw the best talent from all backgrounds into the workforce. Build new accelerator R&D capabilities in academia to broaden R&D engagement and to mitigate a critical workforce pipeline bottleneck.

Strategic Objective 12 – Commercialize innovations to improve the lives of Americans and the world

Objective Leader(s)

- Director, Office of Technology Transitions
- Under Secretary for Science and Innovation
- Under Secretary for Nuclear Security

Contributing Program(s)

- Technology Transitions
- Science
- National Nuclear Security Administration
- Energy Efficiency and Renewable Energy
- Fossil Energy and Carbon Management
- Nuclear Energy
- Environmental Management
- Clean Energy Demonstrations
- Manufacturing and Energy Supply Chains

National Laboratories are premier components in the DOE's innovation portfolio. Research at the National Laboratories spans the RDD&D continuum from basic and use-inspired science to applied R&D and technology development and deployment. Combined with the available suite of scientific user facilities distributed across the complex, the National Laboratories are uniquely positioned to rapidly transition new discoveries to deployable technologies. Furthermore, each of the laboratories has extensive networks of private sector partners from which to draw upon to help transition technology to industry and commercial deployment. The wide geographic distribution of the Laboratories offers incredible opportunity for regional economic development, as new companies are developed to take laboratory discoveries to market. Through their pursuit of basic and use-inspired research, applied research and development, and technology development and deployment supported by DOE and other federal and non-federal partners, the National Laboratories will continue to generate unique and extensive insights and technologies that can generate tremendous economic impact and societal benefits for the Nation.

Support navigation of the Research, Development, Demonstration, and Deployment continuum

In addition to the well-known "valley of death" for technology advancement between government funding and commercialization, another gap can exist between support for basic research provided by the Office of Science and support for applied research provided by other DOE programs such as the Office of Energy Efficiency & Renewable Energy (EERE) and the Advanced Research Projects Agency–Energy (ARPA-E). The Department will continue to bring together stakeholders to close gaps in the pathway to market for key technology areas, such as Vehicle to Everything/Virtual Power Plants. The Department will also continue to take steps to move technology through the RDD&D continuum, including collaborating with partner offices

and National Labs to create market insights, analyses, and tools that can be embedded throughout the DOE research enterprise to support commercialization. These analyses will support DOE decision-making for key funding programs, as well as activate private sector actors, including investors, technology companies, and project developers to accelerate commercialization of energy technologies.

Performance Goals

- By 2023, launch at least 4 new Bipartisan Infrastructure Law (BIL) Technology Commercialization Fund (TCF) programs totaling $100M or more in funding, with the goal of cultivating a broader innovation ecosystem around the BIL provision activities and enable faster replication and scaling of demonstration projects.

Increase access to National Laboratory assets

Increasing visibility and accessibility of the National Laboratories' technologies and capabilities will help foster U.S. innovation and strengthen the domestic supply chain for products and processes in key high-tech areas. National Laboratories can support technology transfer and support commercialization in a number of ways, including technical assistance to solve a specific problem; use of unique facilities; licensing of patents and software; exchange of personnel; Strategic Partnership Projects; and Cooperative Research and Development Agreements. Establishing physical areas at the National Laboratories that are open for collaborative RDD&D with non-federal partners from universities and private sector firms can help build relationships to accelerate the pace of innovation. The Department will continue to grow awareness of DOE technology transfer and collaboration opportunities and expand the network of potential industry partners, for instance through support of the Lab Partnering Service (LPS).

Performance Goals

- By 2025, grow high-potential stakeholder engagement through LPS and conduct an evaluation to inform improvements to the platform.

Encourage and support National Laboratory partnerships

The National Laboratories represent unique resources as anchor tenants in their regional economies and actively seek collaborations with external partners to promote economic and community development. DOE will encourage and support efforts by the National Laboratories to partner with local universities, governments, and economic development organizations to facilitate research collaborations, technology transfer, and local and regional economic development. These efforts can be supported by the Department's efforts to increase engagement with external innovation ecosystem stakeholders, for instance through the Partnership Intermediary Agreement (PIA) pilot and the Foundation for Energy Security and Innovation (FESI), which, if fully implemented, could leverage private funding in support of the DOE mission and commercialization, in coordination with National Labs and National Lab foundations. DOE will continue to support programs that support incubation, entrepreneurial

training opportunities for National Laboratory scientists and engineers, and build the pipeline of the next generation talent to pursue careers in the energy sector and technology transfer.

Performance Goals

- By 2025, fully implement the first DOE-wide Partnership Intermediary Agreement (PIA) pilot involving participation from at least 5 program offices and conduct an assessment of outcomes and lessons learned from the pilot.
- By 2023, launch and implement actions to support regional partnerships and inform program planning and development through DOE's published Request for Information (RFI) *Activation Energy: DOE's National Laboratories as Catalysts of Regional Innovation*.

Goal 4: Ensure America's Nuclear Security by Harnessing Unparalleled Science and Technology Capabilities

The global nuclear security environment is evolving rapidly and in unprecedented ways, presenting unforeseen challenges and the need for policy and technology innovation to address them. Risks to global nuclear security and stability are emerging and accelerating, while familiar threats take on new dimensions in this era of rapidly advancing technology. Existing global powers continue to diversify and, in many cases, expand nuclear arsenals; interests in obtaining nuclear weapons and nuclear energy present increasing proliferation concern; and the risk of cyberattack and use of other new technology is an immediate and growing concern.

The United States is at the forefront of global efforts to address these concerns, while also staying ahead of emerging challenges to nuclear security. Underpinning these efforts is the unparalleled scientific and technological capabilities resident in the National Nuclear Security Administration (NNSA), a semi-autonomous agency within the Department. NNSA's world-class science, technology, manufacturing, and engineering capabilities – including its people, infrastructure, and tools – makes it possible for the United States to lead the way in reducing nuclear dangers, however they emerge. NNSA will provide innovative and practical technological solutions that open the door to reducing the role of nuclear weapons in our security posture and to promoting an enduring and stable nuclear security environment.

Strategic Objective 13 – Design, deliver, and maintain a safe, secure, reliable, and effective nuclear stockpile in support of the Nation's integrated deterrent

Objective Leader(s)

- Under Secretary for Nuclear Security

Contributing Program(s)

- National Nuclear Security Administration

As long as nuclear weapons exist, the United States will maintain a safe, secure, and militarily effective nuclear deterrent. By sustaining the current nuclear stockpile, undertaking multiple comprehensive weapons modernization programs, strengthening key science, technology, and engineering capabilities, and recapitalizing the production enterprise, DOE/NNSA maintains the technical capabilities and a world-class scientific and engineering workforce needed to ensure the effectiveness of the United States' strategic deterrent now and into an uncertain future.

An integrated Nuclear Security Enterprise that is resilient, responsive, and enduring

Ensure that the nuclear weapons stockpile is safe, secure, and militarily effective:

- Ensure effectiveness of the current stockpile through stockpile management (life extensions, modifications, alterations, sustainment).
- Modernize the future stockpile, replacing obsolete technology with more efficient designs, components, and capabilities.
- Collaborate with the Department of Defense to ensure future systems outpace emerging threats and reduce operational risk in the future.

Recapitalize production capabilities and maintain a nuclear security enterprise responsive to need and adaptable to the future security environment:

- Renew and sustain infrastructure capabilities required to produce and assemble nuclear and non-nuclear components and strategic materials to address current and future stockpile needs.
- Re-establish and exercise a production enterprise capable of executing multiple modernization programs simultaneously.
- Leverage stewardship capabilities to ensure a stable, reliable, and trusted domestic supply chain for components, subsystems, and materials; and assess the feasibility and rapidly implement new materials, technologies, and manufacturing processes.
- Ensure integration between the design, production, and manufacturing enterprises earlier in the design process to achieve efficiencies and shorten production timelines to meet military requirements.

Innovate to advance experimental platforms, diagnostic equipment, and computational capabilities to support continued certification and optimization of the stockpile:

- Strengthen science-based stockpile stewardship capabilities to annually assess and certify the

stockpile without underground nuclear explosive testing; maintain nuclear test readiness capabilities if a return to underground explosive testing is required.
- Advance the ability to predict weapon performance in various design configurations to ensure warhead performance in evolving threat environments.
- Invest in scientific capabilities to assess material and component aging, remanufacture, and performance to replace aging stockpile and mitigate future threats.

Maintain cutting-edge technical and scientific expertise to improve responsiveness and support a resilient nuclear security enterprise:

- Shorten development cycles for maturing and certifying warhead design options within all phases of the joint nuclear weapons life cycle process.
- Recruit, train, and retain a highly skilled and diverse workforce to meet evolving mission deliverables.

Provide safe and secure transport of weapons, components, and special nuclear materials to meet military requirements.

Performance Goals

- FY 2022–2026, maintain and modernize the U.S. nuclear weapons stockpile and dismantle retired nuclear weapons: complete 100 percent of annual B61-12 bomb deliveries required to support U.S. Air Force operational needs; complete 100 percent of annual W88 Alt 370 warhead deliveries required to support U.S. Navy operational needs.
- FY 2022–2026, re-establish strategic material production processes: Restart binary production in FY 2024 to produce qualified binary material by 2026.
- FY 2022–2026, recapitalize the Nation's pit production capability to meet the military requirement of no fewer than 80 pits per year: Produce the first War Reserve plutonium pit at the Los Alamos National Laboratory's Plutonium Facility 4 in CY 2024.
- FY 2022–2026, maintain confidence in the nuclear stockpile without additional underground nuclear explosive testing: No later than March 15 each year, complete stockpile assessment using surveillance of existing systems, experiments, and computational analysis.
- FY 2022–2026, provide safe and secure transport of weapons, components, and special nuclear material: Annually achieve 100 percent safe and secure transport of all weapon and material movements.

Strategic Objective 14 – Forge solutions that enable global security and stability.

Objective Leader(s)

- Under Secretary for Nuclear Security

Contributing Program(s)

- National Nuclear Security Administration
- Nuclear Energy
- Intelligence and Counterintelligence

A key U.S. national security objective is to address the potential risks posed by nuclear weapons while enabling the safe, secure, and peaceful use of nuclear energy as a part of the global transition to clean energy. As such, DOE/NNSA delivers significant technical capabilities and expertise to strengthen current and future arms control and nonproliferation regimes, counter the threat of nuclear proliferation and nuclear terrorism, increase strategic stability, and respond to nuclear and radiological incidents and accidents worldwide. Moreover, DOE/NNSA has a multi-pronged approach for ensuring the peaceful uses of civil nuclear technology, which includes strengthening regulatory frameworks, developing technical advancements to prevent proliferation, and supporting the nonproliferation architecture.

DOE/NNSA is committed to developing and maintaining a world-class workforce to help ensure that it maintains a qualitative edge over adversaries and stays ahead of evolving proliferation threats. NNSA carries out its nuclear nonproliferation and nuclear threat reduction mission in partnership with the Departments of State, Defense, Homeland Security, the Nuclear Regulatory Commission, the Federal Bureau of Investigation, the Intelligence Community, as well as international partners such as the International Atomic Energy Agency (IAEA).

Achieve national and global security and stability while supporting peaceful uses of nuclear energy

Identify, assess, deter, and manage emerging and future proliferation trends:

- Develop cutting-edge nuclear proliferation detection capabilities.
- Help develop and implement means to verify existing and new international arms control treaties or agreements.
- Advance and mature ideas for emerging threats for dual-use weapons, cyber, artificial intelligence, and/or other national security threat vectors.

Prevent and counter access to materials, technology, and expertise:

- Eliminate, remove, and minimize weapons-usable nuclear and radioactive materials.
- Secure nuclear and radioactive materials and facilities in the United States and around the world.
- Control the spread of proliferation-related materials, technology, and expertise.
- Impede the efforts of proliferant states to obtain nuclear capabilities.

Maintain readiness to respond to nuclear and radiological incidents and accidents:

- Build scientific and technical understanding of nuclear/radiological threat devices.
- Build domestic and international partner capacity to prepare for and respond to nuclear emergencies.
- Develop and maintain world-class nuclear forensics capabilities.
- Refine and lead a more enterprise-wide, collaborative emergency management approach and overarching continuity programs.

Performance Goals

- Convert or verify the shutdown of Highly Enriched Uranium (HEU) fueled research reactors: By the end of FY 2026, convert or verify shutdown prior to conversion of approximately 111 HEU reactors and isotope production facilities.
- Remove or confirm the disposition of weapons-usable nuclear material: By the end of FY2026, remove or confirm the disposition of 7,360 kilograms of highly enriched uranium and/or plutonium.
- Establish international partnerships to strengthen operational capability of counter nuclear smuggling systems: By the end of FY 2026, establish counter nuclear smuggling capability and technical cooperation with 95 countries.
- Maintain technical and manpower readiness for future U.S.-led monitoring and verification of denuclearization activities: From FY 2022–2026, conduct regular verification team exercise and training events, approximately four per year.
- Improve U.S. capabilities to detect and characterize low yield and evasively conducted underground nuclear explosions: By FY 2026, conclude first phase of integrated field experiments at the Low-Yield Nuclear Monitoring testbed.
- Enhance National Nuclear Material Archive (NNMA) Sample Analysis: By FY 2026, install, proof-test and maintain the capacity to analyze 50 National Nuclear Material Archive samples per year.
- Enhance and improve the Emergency Management Enterprise and Departmental Continuity programs, focused on improving integration of, and collaboration with, the various DOE and NNSA leadership and operations centers, and interagency partners.
- Toward support of peaceful use of nuclear technologies globally, maintain participation in the OECD/NEA's Steering Committee, the IAEA's INPRO initiative, Technical Working Group on Nuclear Power Infrastructure, and General Conference.
- Maintain leadership in civil nuclear multilateral and bilateral events and fora including the P-TECC Nuclear Energy Working Group, Task 7 Nuclear Energy Working Group of the U.S.-Japan Clean Energy and Energy Security Initiative, the U.S.-India Civil Nuclear Energy Working Group, the U.S.-France Action Plan. Facilitate the leadership expansion of NICE Future to strengthen support from France and the UK.
- Partner across DOE to develop a strategic roadmap for a modernized comprehensive emergency management system, highlighted by an innovated and more collaborative emergency operations center space.

- Enhance resiliency across the nuclear security enterprise, focusing on implementation of the tenets of federal mission resilience to advance essential function performance against any threat.

Strategic Objective 15 – Harness the atom to safely, reliably, and affordably power a global fleet that enables unrivaled responsiveness, endurance, stealth, and warfighting capability

Objective Leader(s)

- Under Secretary for Nuclear Security

Contributing Program(s)

- National Nuclear Security Administration

U.S. Naval warships are deployed around the world every hour of every day to provide a credible "forward presence," ready to respond on scene wherever America's interests are threatened, and nuclear propulsion plays an essential role in the Navy's ability to conduct missions vital to national security. Today, more than 40 percent of the Department of the Navy's major combatants are nuclear-powered.[6] Naval Reactors (NR) is a joint Department of Energy/Department of Navy organization responsible for providing militarily effective nuclear propulsion plants and ensuring their safe, reliable, and long-lived operation.

National Security

Maximize operational availability while managing resources effectively and efficiently:

- Meet the Navy's operational requirements for nuclear propulsion plant availability at affordable acquisition and lifecycle costs and ensure that emergent Fleet issues and challenges are addressed promptly and expertly to minimize operational impact and cost.

Develop new nuclear propulsion plants and associated technology for the Navy:

- Deliver battle worthy, reliable, safe, cost-effective, environmentally sound nuclear power and propulsion plants to meet assigned missions.
- Maintain a robust research, development, and design effort together with manufacturing capabilities to sustain the Program's ability to support operational ships and to deliver new plants.

[6] Major combatants, in this instance, include aircraft carriers, submarines, and surface combatants based on the "Active in Commission" column from the Naval Vessel Register.

Manage our nuclear infrastructure to ensure its viability, efficiency, and effectiveness:

- A well-maintained, efficient, and technically capable infrastructure (including people, their skills, and the supporting physical assets) is vital to long-term success of cradle-to-grave nuclear support.

Provide trained nuclear operators to the Fleet:

- Highly-competent nuclear operators for naval nuclear propulsion plants are essential for Program success.

Deliver productivity safely:

- Through personal ownership and responsibility for work, deliver products on time and within budget while maintaining standards of quality, public and personnel safety, environmental protection, and in-service support.

Performance Goals

- Continue progress toward completing COLUMBIA-Class submarine reactor plant design: By FY 2027, complete the submarine reactor plant design.
- Complete the S8G Prototype Refueling project by FY 2024.

Goal 5: Promote Equity and Energy Justice

DOE commits to the successful implementation of initiatives that support underrepresented groups, disadvantaged communities, and the DOE federal workforce to ensure that equity is enduringly embedded into the Department's policies and activities. The successful implementation of these priorities across the DOE enterprise requires embedding equity in the agency's hiring, procurement, financial assistance, research and development (R&D), and demonstration and deployment (D&D) activities, as well as cross-agency investment in the foregoing workstreams. Implementation further requires the development of ample metrics to baseline the agency's current activities and create milestones for subsequent achievement.

Strategic Objective 16 – Advance equity in DOE's procurement, funding, R&D and D&D processes and activities

Objective Leader(s)

- Director, Office of Management
- Under Secretary for Science and Innovation
- Director, Small & Disadvantaged Business Utilization

Contributing Program(s)

- All DOE Programs

The Department's equity assessment revealed a range of barriers underserved communities face when attempting to engage DOE's procurement, funding, R&D and D&D processes and activities.

Barriers include:

- Insufficient awareness of DOE funding and financial assistance opportunities;
- Lack of technical assistance, outreach, and support for minority-serving institutions (MSIs) and minority business entities (MBEs); and
- Lack of granularized data collection regarding management and operating (M&O) contractor subawards and DOE financial assistance generally.
- Challenges in set-asides:
    - The "Rule of Two" not being applied for total small business set-asides, socioeconomic set-asides, and master agreements
    - No current designated set-asides for more inclusive underserved businesses
- Complex requirements in solicitations - Safety, security, and cybersecurity requirements are challenging and not easily transferable to other requirements
- Lack of consistency in posting opportunities across multiple DOE and Subcontract forecasts
- Absence of primes serving as mentors, lack of mentoring funding to primes, and limited work that a mentor could give a protégé affect the success of the Mentor-Protégé Program
- Lack of small business data analytics to support advocacy efforts
- Proposal evaluation criteria and scoring methodology not being conducive to small business participation and commitment

The Department's goal is to remove barriers to participation in DOE procurement, funding, R&D, demonstration, and deployment processes and activities by:

- Enhancing awareness of financial assistance and contract opportunities
- Deepening technical assistance for all in need of it, including MSIs, MBEs, and other underrepresented entities
- Creating an efficient system of data collection across DOE financial assistance, R&D, demonstration, and deployment spaces

- Instituting more consistent application and accountability regarding how set-asides and related tools should be used to increase opportunities for small and disadvantaged businesses
- Increasing accountability of the mentor and protégé agreement partners to maximize meaningful small business engagement
- Performing analysis of data to identify where targeted efforts will likely have the most positive effect on increase in small business socioeconomic categories utilization in prime contracting; and
- Holding agency program elements accountable for meeting small business goals

Performance Goals

- By the end of second quarter FY 2023, embed senior equity staff within each research, development, and deployment program at the agency.
- By the end of second quarter FY 2023, create a centralized announcement portal, to communicate upcoming agency contracts and financial assistance opportunities to socioeconomic underserved communities using SAM.Gov and grants.gov.
- By the end of first quarter FY 2023, expand collaborations with agency-internal and external small business resources, SBA's Small Business Development Centers, and Procurement Technical Assistance Centers.
- By the end of FY 2023, institute agency Senior Leadership guidance encouraging application of set-asides, by consistent application of the "Rule of Two" for total small business set-asides, socioeconomic set-asides, and master agreements and providing for designated set-asides, and enforcing statutory set-asides for Small Disadvantaged Businesses, Women-Owned Small Businesses, Service-Disabled Veteran-Owned Small Businesses, and Historically Underutilized Business Zones firms.
- By the end of FY 2023, institute Senior Leadership guidance removing barriers to make safety, security, cybersecurity, and other complex requirements more easily transferable to other requirements.
- By the end of FY 2023, update DOE Mentor-Protégé Program guidance to be more consistent across participants, and to encourage Mentors to offer more broadly applicable opportunities to Protégés.
- By the beginning of the second quarter FY 2023, provide more data analysis resources to agency-internal small business advocates to better capture prime and subcontracting data needed to assess more effectively small business programs. This includes:

    - instituting regulations to address data required for reporting and oversight, and
    - providing additional standardized small business data analytics to enhance advocacy efforts.

- By the end of FY 2023, enhance Senior Leadership guidance to address Category Management challenges, including consolidation and bundling requirements and "mandatory use" procedures.
- By the end of FY 2023, institute Senior Leadership guidance to make proposal evaluation criteria and scoring methodology more conducive to small business participation.

- By the end of first quarter FY 2023, capture data on the amount and percentage of financial assistance awards to MSIs.
- By FY 2025, increase DOE financial assistance for MSI's, with a goal of 15% of awards awarded to MSI's.
- By the end of second quarter FY 2023, establish an environmental justice-centered policy for siting and development, including considerations of consultation and consent for marginalized communities.
- By the end of FY 2022, develop Limited English Proficiency (LEP) technical assistance guidance for DOE program offices and funding officials to ensure that funding opportunity announcements and public participation activities that inform Department funding and investments, are accessible to LEP individuals and communities.
- Beginning in fourth quarter FY 2022, launch a Civil Rights Pre-Award Assurance Pilot program that will review neutrally selected financial assistance applicants for compliance with civil rights laws.

Strategic Objective 17 – Increase access to affordable, sustainable, and reliable energy for disadvantaged communities

Objective Leader(s)

- Under Secretary for Infrastructure
- Under Secretary for Science and Innovation
- Director, Economic Impact and Diversity

Contributing Program(s)

- Energy Efficiency & Renewable Energy
- Economic Impact and Diversity
- U.S. Energy Information Administration
- Electricity
- Grid Deployment Office
- Indian Energy
- Loan Programs Office
- State and Community Energy Programs
- Nuclear Energy
- Fossil Energy and Carbon Management
- Arctic Energy

Energy burden remains an issue of concern for the country. According to the 2015 Residential Energy Consumption Survey conducted by the U.S. Energy Information Administration (EIA), nearly one in three U.S. households has struggled with energy insecurity, or lack of ability to pay for energy. White households experienced energy insecurity at a rate of 28%. Communities of color fared far worse according to the survey. Hispanic and Latinx households experienced energy insecurity at a rate of 45%; Black households at a rate of 52.2%.

More research is needed to understand the root causes of energy insecurity, the pervasiveness of energy poverty (lacking access to reliable energy), and the equitable technology pathways the Department can harness to reduce energy burden (the overall amount a household pays for energy) across the country. To do so, the Department will need to develop a research program to address issues of energy insecurity and utilize new streams of deployment dollars to serve disadvantaged communities.

Based on a June 2020 report by Oak Ridge National Laboratory (ORNL), the energy burden for the Weatherization Assistance Program eligible population was estimated at 13. 9 percent compared to 3. 0 percent for higher-income U. S. households. This report will be updated as new data is available and will also assist DOE in identifying regions where high energy burden correlates with other factors such as household demographics or environmental justice communities. Service delivery will be studied with the goal of identifying and sharing best practices and strategies among the weatherization provider network.

Performance Goals

- By the end of FY 2022, create a research partnership between EIA and ED designed to collect and analyze data on energy insecurity and energy burden.
- By the end of FY 2023, launch a research initiative to analyze gaps in energy access nationally.
- By the end of FY 2022, launch an ambitious Equity Earthshot to address energy insecurity and energy burden.

Strategic Objective 18 – Ensure 40 percent of the overall benefits of relevant federal investments are delivered to disadvantaged communities

Objective Leader(s)

- Under Secretary for Science and Innovation
- Director, Economic Impact and Diversity
- Chief Financial Officer
- Director, Management

Contributing Program(s)

- All DOE Programs

The Justice40 Initiative sets the goal that 40% of the benefits of climate and clean energy investments flow to disadvantaged communities. ED leads this historic initiative across DOE. Key FY 2021 activities included the creation of an Energy Justice Dashboard (BETA) to publicly display DOE procurement, contracting, and cooperative agreement expenditures. ED also established a Justice40 Community of Practice to integrate the Justice40 Initiative into DOE programs. Successful implementation of the initiative will require ongoing collaboration across the DOE enterprise as well as enhanced data collection across programs to ensure that the agency is meeting the goals of the initiative.

Performance Goals

- By the end of first quarter FY 2023, enhancing the existing Energy Justice Dashboard (BETA) to include metrics related to the Justice40 Initiative.

Strategic Objective 19 – Support economic development, including through clean economy opportunities for workers in communities and industries in transition, like former coal and power plant communities.

Objective Leader(s)

- Executive Director for Office of Policy
- Director, Economic Impact and Diversity

Contributing Program(s)

- Policy
- Economic Impact and Diversity
- Fossil Energy and Carbon Management
- State and Community Energy Programs
- Clean Energy Demonstrations
- Applied Science and Innovation Programs

The energy transition will create millions of high-quality jobs across diverse clean energy fields and will revitalize underserved and economically distressed communities, including those affected by coal and power plant closures. DOE commits to building an infrastructure (including internal and external partnerships, communication methods, and educational programs) to facilitate job creation and ensure that such jobs opportunities are equally available to women and other underrepresented groups.

The Department will create an overall strategy for job creation which leverages DOE deployment activities and existing relationships with MSIs and MBEs.

Performance Goals

- By the end of second quarter FY 2023, create a strategic roadmap, organized by clean energy industry, for job creation.
- By the end of second quarter FY 2023, create a strategic roadmap for engaging partners such as job training programs, MBEs, MSIs, technical training institutions, and community colleges to ensure diverse participation in the agency's deployment activities.
- Develop performance metrics for job creation across each clean energy industry.
- By the end of FY2024, establish a library of case studies providing detailed, site-specific analyses for coal communities interested in transitioning to nuclear energy[7].

7 The 2022 DOE Report "Investigating Benefits and Challenges of Converting Retiring Coal Plants into Nuclear Plants" showed converting the nation's coal power plant sites to nuclear power plants that has the potential to add 650 permanent new jobs per site.

Strategic Objective 20 – Enhance engagement and energy economic development opportunities in Tribal communities

Objective Leader(s)

- Assistant Secretary for Congressional and Intergovernmental Affairs
- Under Secretary for Science and Innovation
- Under Secretary for Infrastructure

Contributing Program(s)

- Indian Energy
- Congressional and Intergovernmental Affairs
- Applied Science and Innovation Programs
- Economic Impact and Diversity
- Loan Programs Office
- Arctic Energy
- State and Community Energy Programs
- Clean Energy Demonstrations
- Grid Deployment Office

The Department maintains a unique relationship to Tribal and Native Alaskan communities, and commits to directing agency resources to Tribes, which experience high rates of energy insecurity and low levels of engagement with DOE programs.

The Department will increase clean energy demonstration and deployment activities in Tribal and Native Alaskan communities.

Performance Goals

- Through direct outreach to Indian tribes and Alaska Native corporations, by the end of fiscal year 2025 increase the number of funding applications from Indian tribes who have not previously received funds from the Office of Indian Energy by 10% and increase the total number of technical assistance requests received by 15% from the 2022 amounts.

Strategic Objective 21 – Support diversity and equity among researchers, projects, entrepreneurs, and the National Laboratories

Objective Leader(s)

- Chief Human Capital Officer
- Director, Economic Impact and Diversity
- Director, Office of Legacy Management

Contributing Program(s)

- All DOE Programs

DOE has an opportunity to enhance its diversity, equity, inclusion, and accessibility (DEIA) impact at the agency and in its activities with the National Laboratories through targeted outreach and enhancement of existing, successful programs creating an agency-wide DEIA strategy that incorporates internal and external DEIA requirements.

Performance Goals

- Advance diversity, equity, and inclusion by promoting women and underrepresented minorities in STEM fields. By end of FY 2022, update funding solicitation and award management policies and processes to ensure consideration of diversity, equity, and inclusion principles.
- By the end of FY 2022, establish a DOE DEIA Council, led by the Chief, DEIA Strategic Planning Division under ED and the Supervisory Diversity Manager, Workforce Management Division under EM.
- By the end of FY 2022, establish a DOE Employee Resource Group for persons with disabilities.
- By end of FY 2022, increase outreach efforts to entities and individuals historically underrepresented in the SC research portfolio, including Historically Black Colleges and Universities (HBCU), Tribal Colleges and Universities (TCU), Minority Serving Institutions (MSI's), and those in underrepresented and disadvantaged communities.
- In first quarter FY 2023, organize and coordinate implementation of annual cross-cutting program office challenge geared towards HBCUs, TCUs, and MSIs.
- Review, evaluate, and disseminate best practices for diversity, equity, and inclusion strategies at the DOE National Laboratories.
    - In FY 2022, create a review schedule and begin conducting external peer reviews of the DOE National Laboratories' diversity, equity, and inclusion strategies and beginning in FY 2024 tie review outcomes to Laboratory performance evaluations.
    - Prepare and disseminate Artificial Intelligence (AI) ethical practices and guidelines for diversity and equity model and algorithmic adoption with annual renewal.
    - Provide ODEIA staff insights on AI projects and the DOE cross-cut impacts.
- In FY 2022, create STEM pipeline program for diverse summer interns to be provided opportunities to apply for DOE permanent federal employment.

Goal 6: Advance Clean-Up of Radioactive and Chemical Waste

The Department, through the Office of Environmental Management (EM), is responsible for one of the largest environmental remediation efforts in the world. Decades of nuclear weapons development and government-sponsored nuclear energy research resulted in substantial environmental contamination at 107 sites across the country, mostly located in remote and rural areas of the United States.

For over 30 years, EM has cleaned up the radioactive and chemical contamination left behind by six decades of weapons production and energy research during the Manhattan Project and the Cold War. To date, EM has completed cleanup at 92 sites in 30 states and the Commonwealth of Puerto Rico. With significant legacy cleanup remaining, both in risk and technical complexity, EM remains focused on fulfilling the responsibility of protecting communities across America. Consistent with the EM Strategic Vision, EM is reducing risk and cleaning up the environmental legacy at the remaining sites, including transformational progress in cleaning up millions of gallons of liquid tank waste; disposing of large volumes of transuranic (TRU) waste, as well as significant quantities of mixed/low-level waste; and remediating considerable quantities of contaminated soil and groundwater. Further, EM is completing demolition of key contaminated facilities at sites, such as the former Portsmouth Gaseous Diffusion Plant in Ohio and the West Valley Demonstration Project (WVDP) in New York, creating a skyline change for the sites and the surrounding communities.

Strategic Objective 22 – Support environmental remediation

Objective Leader(s):

- Senior Advisor, Office of Environmental Management
- Director, Office of Legacy Management

Contributing Program(s):

- Environmental Management
- Legacy Management
- National Nuclear Security Administration

The Office of Environmental Management (EM) remains committed to protecting the communities that supported and sacrificed for the United States' successes in World War II, and in the decades that followed. EM coordinates with other Department program offices, such as the Office of Science, the National Nuclear Security Administration, and the Office of Nuclear Energy, to address excess facilities, further reduce risk, and advance active and future departmental missions. EM also supports departmental initiatives regarding infrastructure resilience, workforce sustainability and diversity, and environmental justice.

Continue Cleanup of Nuclear Waste Sites

EM leverages past cleanup experience, best practices, and lessons learned while executing its cleanup objectives within a framework of regulatory compliance commitments, consistent with its Strategic Vision. EM is prioritizing the development of new and innovative strategies and technologies for environmental cleanup and risk reduction to further strengthen its ability to tackle the scope and magnitude of the remaining cleanup work. The National Laboratories, including the Savannah River National Laboratory, are pivotal to the successful achievement of EM's mission, particularly its tank waste mission. EM continues to strengthen program management, acquisition, stakeholder engagement, and other processes, and to implement effective mechanisms that will continue to enhance cost and schedule performance. These organizational improvements, along with an emphasis on continuous improvement, will underpin cleanup achievements across the EM complex in the coming years.

Post-Closure Activities at Nuclear Waste Sites

After cleanup is completed at remediated sites without continuing missions, the Office of Legacy Management (LM) manages DOE's post closure obligation to protect human health and the environment. LM's Long-Term Surveillance & Maintenance (LTSM) include operation and maintenance of active remedial action systems, routine inspections, monitoring, and maintenance; ensures records of site operations, remediation, and LTSM activities are collected, preserved, and made available to stakeholders; and ensures sites and facilities are managed, including identifying opportunities for beneficial reuse.

LM continues to ensure post-retirement benefits are dedicated to the caring for and honor of former nuclear-site workers. LM remains committed throughout all its activities to engage with

the public and governments at all levels and consult and collaborate with Tribal Nations and Alaska Native communities.

Performance Goals

- Advance the EM tank waste mission by initiating treatment of sodium bearing waste at Idaho in FY 2023, initiating treatment of tank waste at Hanford in FY 2024, and ramping up processing of salt solution waste at the Savannah River Site Salt Waste Processing Facility up to 9 million gallons, or equivalent curies, per year by FY 2026.
- Disposition 30 shipments in FY 2022 and 40 shipments in years FY 2023-2026 of transuranic waste at the Waste Isolation Pilot Plant from the EM-LA site inventory.
- Complete the demolition of key former nuclear processing facilities, including the first of the three former enrichment process buildings at the Portsmouth site by FY 2025; and the Main Plant Process Building, the last major facility at West Valley, by FY 2026. Post-demolition cleanup and waste removal for the High Flux Beam Reactor Exhaust stack at the Brookhaven National Laboratory will be completed by the end of FY 2022, resulting in EM mission completion at its 92nd cleanup site.
- Complete disposition of the R-114 refrigerant at Paducah by the end of FY 2026.
- Complete demolition of key excess facilities, such as the LLNL Building 280 Livermore Pool Type Reactor by FY 2026.
- Continue remediation of soil and groundwater at EM sites, including completing soil remediation at the East Tennessee Technology Park by FY 2025 and removing the remaining uranium mill tailings from Moab by the end of FY 2026.
- Conduct long-term surveillance and maintenance (LTS&M) activities at all sites within LM's responsibility to ensure the effectiveness of cleanup remedies according to legal agreements and identify sites subject to additional remedial action in order to continue the protection of the human health and environment.
- Reduce the cost of performing LTS&M activities while meeting all regulatory requirements to protect human health and the environment.

Goal 7: Operational Excellence

Attaining mission success requires a sustained commitment to performance-based management and expectations of excellence from DOE headquarters to every site office, service center, laboratory, and production facility. At the center of this goal is a highly qualified, capable, diverse, and flexible federal workforce who can execute the mission in a safe, secure, efficient, and sustainable manner. With a focus on achieving an inclusive and engaged work culture where individual differences and perspectives are recognized and celebrated as critical inputs to innovation, DOE cultivates a performance-based system that links work to meeting agency and Administration goals and achieving results. Management of research, development, demonstration & deployment (RDD&D) involves executing those activities with the greatest potential and likelihood for impact. Research decisions are informed by rigorous peer reviews at the portfolio level and solicitation levels. Also, improving contract and project management across the DOE enterprise is a top priority, along with vigilant protection of our cyber networks. Additional project cost and schedule analysis training will be provided, and upgrades will be sought for the information technology infrastructure. To further streamline and increase efficiency, the Offices of Chief Financial Officer (CF), Chief Information Officer (IM), and Management (MA) conducted a joint pilot to acquire institutional knowledge on implementing Robotic Process Automation (RPA) (i.e., "bots") solutions to automate certain DOE enterprise business processes. Significant interest in RPA technology among DOE departmental elements and lessons learned from planning and executing the joint CF/IM/MA pilot have indicated that the department as a whole could benefit from a coordinated approach to RPA implementation. To track this effort and further explore its impact via evaluation, it is in the process of being drafted and added to the Department's FY25 Learning Agenda and titled as: *Improve Automation to Increase Efficiency and Effectiveness of DOE Corporate Business Systems*.

Strategic Objective 23 – Attract, manage, train, and retain the best federal workforce to meet future mission needs

Objective Leader(s)

- Chief Human Capital Officer

Contributing Program(s)

- Chief Human Capital Officer
- Chief Financial Officer
- Economic Impact and Diversity

DOE faces serious workforce challenges over the coming decade, with nearly 50% of its federal employees eligible to retire, including many of its most experienced and highly skilled professionals. Coupled with the expansion of DOE's mission to combat the challenges of the climate crisis and upgrade our country's infrastructure assets, this represents a unique opportunity to build a workforce pipeline of diverse talent ready to meet these new challenges. The Department must take a disciplined approach to its workforce needs and the strategies it leverages to recruit and compete for the critical skills needed to meet our important mission.

To address these challenges, the Human Capital Strategic Plan (HCSP) includes goals focused on growing DOE's ability to attract top talent, expanding professional development, promoting career progression, and developing strategies that create an environment of diversity, inclusiveness, collaboration, and flexibility. The HCSP is a 5-year plan that links to the Human Capital Operating Plan (HCOP), which serves as the roadmap and includes objectives and milestones to achieve these goals. The HCOP milestones were developed in consultation with departmental element customers and include key performance indicators to track progress toward strategic goals. Customer facing dashboards will serve as a mechanism to evaluate DOE's status against benchmarks established in the President's Management Agenda and provide DOE leaders with valuable data that will assist in making effective workforce, resource, and budgetary decisions.

Through effective workforce planning, DOE will ensure agile staffing structures aligned to support organizational priorities. With a strategic emphasis on increased recruitment and outreach, DOE will build a pipeline of high-quality, diverse talent with the skills and commitment needed to meet the pressing needs of the climate crisis. DOE will leverage best practices in leadership, engagement, and inclusion to create a dynamic work environment that is at the forefront of promoting work-life flexibilities to support and elevate our workforce to be their best. DOE will ensure equal access to learning, development, and career advancement opportunities to support employee retention and ensure mission continuity.

DOE is committed to improving human capital policies, programs, and systems through a customer-focused approach that prioritizes ease of access, and efficient procedures to deliver services that enable program leadership to execute mission requirements, eliminate organizational redundancies and use capable and cost-effective information technology systems. Efforts are underway to reduce the time to hire through increased use of hiring flexibilities and maximizing the capabilities of the Department's upgraded staffing system. There are plans to

continue to standardize phases of the hiring process, including position descriptions and job analyses, and integrate competencies into the recruitment process that can inform the Department's continuous development efforts in closing identified skill gaps. By integrating these human capital strategies into the Department's plans to strengthen diversity, inclusion, equity, and accessibility, DOE will draw upon all parts of society, ensuring diverse perspectives are available to inform the key actions we must take to address these critical issues and their impact on our ability to combat the climate crisis.

Performance Goals

- Hiring Efficiency & Service Delivery: Improve efficiency in human resources processes by increasing the use of hiring flexibilities, subject to applicable law, expanding recruitment strategies, and incorporating analytics and data intelligence into organizational decision-making. The HCOP includes milestones such as reducing overall time-to-hire, promoting use of Pathways programs, and building a robust Position Management program.
- HRIT & Operational Effectiveness: Optimize efficiency and continuous process improvement through maximizing the use, and capabilities, of modern HR information technology platforms and deploying customer facing dashboards. The HCOP includes milestones such as upgrading existing HRIT systems and developing data dashboards. Utilizing an automated HCOP tracking system will aid in ensuring consistent progress.
- Employee Development and Retention: Increase continual learning opportunities, expand professional development, and promote career progression for long-term talent retention. Increase positive responses to the Federal Employee Viewpoint (FEVS) question "I am given a real opportunity to improve my skills within my organization" annually. Reduce attrition among high performing employees to less than 32% of all Departmental attrition.
- Workforce Engagement: Provide HC communications, programs, and tools for leaders to develop a workplace that fosters a sense of community, work-life balance, and wellness. The HCOP includes milestones such as promoting DEIA strategies, developing employee engagement toolkits for leadership, and launching employee engagement surveys and exit interviews.

Strategic Objective 24 – Use taxpayer funds efficiently and effectively and improve visibility into how funds are being used

Objective Leader(s)

- Chief Financial Officer

Contributing Program(s)

- Chief Financial Officer
- Chief Information Officer
- Management
- Public Affairs
- Environment, Health, Safety and Security

The Department of Energy's mission is supported through annual appropriations that strengthen the Nation's prosperity and security by addressing energy, environmental, and nuclear challenges through transformative science, technology, and deployment solutions. In FY 2022, DOE received appropriations totaling approximately $45B. Due to the nature of the Department's no-year appropriations authority, at a given time DOE is responsible for management and execution of more than $60B+ in total funding, a combination of current year appropriations and prior year funding. Additionally, through IIJA and IRA, DOE will receive an additional $97B+ over the next 5 years.

Receiving appropriations and resources from the American taxpayer bears a responsibility to use funds appropriately and efficiently, while minimizing and mitigating potential financial and operational risks to the American taxpayer, the DOE workforce, the public, and environment. Enhancing visibility and transparency is an important tool for strengthening funds management and resource efficiency, while promoting the Department's vital mission to the American public. To manage the funds and assess progress, DOE is developing tools that will provide an unprecedented level of information about financial execution and the benefits of the funding on achieving climate goals.

Performance Goals

- Provide the American public an enhanced view of DOE funding including public-facing metrics to show what DOE is accomplishing and to highlight exceptional DOE projects and initiatives.
- Develop a dashboard to inform DOE leadership of key execution and performance data by the end of calendar year 2023.
- Improve the planning and budgeting processes to meet long term climate and national security goals to be reflected in the FY 2025 budget and beyond.

Strategic Objective 25 – Monitor Departmental performance to ensure that program activities are executed in a safe and secure manner consistent with Departmental direction

Objective Leader(s)

- Director, Office of Enterprise Assessments

Contributing Program(s)

- Enterprise Assessments

The Department of Energy is charged with many missions that are key to the national security, environmental protection, and scientific advancement of the United States. Threats to accomplishment of these missions include overt and surreptitious acts by domestic and foreign terrorists, nation states who are competitors both economically and militarily, and decisions and actions by Departmental personnel that might threaten or inhibit mission success, the security of national security assets, the health and safety of the public and DOE employees, or the environment. The Department conducts a rigorous program of internal, independent oversight of line management activities to ensure that these and other threats are adequately addressed through compliance with established safety and security policies, which in turn supports Departmental mission success.

Performance Goals

- During FY2022-2026, conduct risk-based assessments of health, safety, and security programs, facilities and operations.
- During FY2022-2026, conduct risk-based assessments of cyber security protection programs.
- During FY 2022-2026, employ the Department's Enforcement authorities for the most impactful contractor safety and security violations as appropriate.

Appendix A. DOE Evaluation and Evidence Building

At DOE, the implementation of evaluation and evidence-building actions (i.e., statistics, research, studies, and analysis) is embedded as part of the planning and execution efforts of each of the program and functional offices. Given the variety of DOE activities, the Department relies on Program Managers to accomplish program management objectives and related evaluation requirements. Program Managers tailor program strategies, oversight, evaluations, and analysis including documentation of program information, program phases, and the timing and scope of decision reviews and decision levels, to fit the particular conditions of that program, consistent with applicable laws and regulations and the time sensitivity of the capability need. This tailored approach is based on program size, complexity, and risk considering DOE programs cover a wide spectrum (ranging from nuclear security to research and development to building weatherization). In addition. the effectiveness of programs and program managers is often assessed by applicable leadership (i.e., supervisors), the program(s) themselves, and independent – and in some cases, external – parties.

As stated in DOE Policy (P) 410.3, *Program Management*, DOE programs conduct rigorous and independent evaluations to:

- Determine effectiveness, efficiency, relevance, and sustainability of DOE programs;
- Develop and disseminate lessons learned from evaluations to inform planning, programming, and resource decisions; and,
- Facilitate mutual learning and reduce costs.

In conducting these evaluations, programs adhere to the following core Program Evaluation standards to ensure high quality, scientific integrity, and consistent evaluation results:

- Relevance and utility;
- Rigor;
- Independence and objectivity;
- Transparency;
- Diversity, equity, inclusion, and accessibility;
- Cost efficiency; and
- Integration.

For more regarding specific Learning Agenda efforts the Department is pursuing as well as detailed evaluation and evidence-building efforts by each of the program and functional offices for enhancement of their knowledge base and to inform decision makers, refer to: *DOE Program and Functional Offices Evaluation/Evidence-Building Activities, FY 2023 Evaluation Plan, Learning Agenda, and Capacity Assessment*.

Appendix B. DOE FY 2022-2023 Agency Priority Goals

DOE Priority Goals (FYs 2022-2023)	Goal Leader(s)
Clean Energy Innovation and Deployment. Support integrated research, development, demonstration and deployment of cost-competitive, clean energy technologies to achieve net zero goals while promoting good paying clean energy jobs, domestic manufacturing, resilient supply chains, and benefits to disadvantaged communities. By September 30, 2023, publish 5 crosscutting innovation and deployment strategies with performance and deployment targets that help to achieve economy-wide emissions reductions of 50-52 percent by 2030 compared to 2005 levels and net zero emissions by 2050.	Dr. Geraldine Richmond, Under Secretary for Science and Innovation David Crane, Under Secretary for Infrastructure
Energy Sector Cybersecurity. Increase the overall cyber resilience of the grid by addressing critical cyber vulnerabilities prior to adversary exploitation through a multi-faceted approach that includes applying classified threat intelligence, illuminating systemic cyber supply chain risks, cyber vulnerability testing and forensic analyses, and engineering out cyber risks – all in close partnership with asset owners and manufacturers across the Energy Sector Industrial Base. By September 30, 2022, analyze no less than 10% of critical components in energy sector systems; and expand manufacturers participating in the voluntary Energy Cyber Sense program to cover no less than 15% of the market share of critical components. Drive down overall cycle time for critical vulnerability discovery to mitigation to notification of impacted asset owners by at least 10%, compared to a 2021 baseline. By September 30, 2023, analyze no less than 15% of critical components in energy sector systems; and expand manufacturers participating in the program to cover no less than 30% of the market share of critical components.	Daniel Lagraffe, Deputy Director for Risk Management - Cybersecurity, Energy Security, and Emergency Response Dr. Stephanie Johnson, Program Manager for Cybersecurity - Cybersecurity, Energy Security, and Emergency Response

Environmental Management & Nuclear Waste Disposal. To execute key projects of the EM cleanup mission, including treatment of radioactive tank waste and disposal of transuranic waste and mill tailings. By September 30, 2022, EM will treat 500,0000 gallons of waste through Tank-Side Cesium Removal System; By September 30, 2023, EM will treat a total of 9 million gallons of waste through the Salt Waste Processing Facility; By September 30, 2023, EM will increase Salt Stone disposal capacity by 34 million gallons with completion of Saltstone Disposal Unit 8; By September 30, 2023, EM will complete demolition of the X-326 Gaseous Diffusion Plant building at Portsmouth; For FY 2022 and 2023, EM-Los Alamos will send 30 shipments of transuranic waste to WIPP by September 30 for each fiscal year (60 shipments total); By September 30, 2022, EM-Moab will dispose 750,000 tons of uranium mill tailings; and by September 30, 2023, will dispose an additional 1 million tons of uranium mill tailings.	Candice Robertson, Senior Advisor for Environmental Management to the Deputy Secretary Jeff Avery, Principal Deputy Assistant Secretary for Office of Environmental Management
Nuclear Security. Maintain and modernize the U.S. nuclear weapons stockpile and dismantle retired nuclear weapons, as directed by the President through the Nuclear Posture Review, as well as enable further international nuclear nonproliferation and arms control progress. By September 30, 2023, complete 100 percent of annual B61-12 bomb deliveries required to support fiscal years 2022 and 2023 U.S. Air Force operational needs. (WA) By September 30, 2023, complete 100 percent of annual W88 Alt 370 warhead deliveries required to support fiscal years 2022 and 2023 U.S. Navy operational needs. (WA) By September 30, 2023, replace 330 cesium irradiators with non-radioactive source-based technologies. (DNN)	Dr. Marvin Adams, Deputy Administrator for Defense Programs - National Nuclear Security Administration J David Hoagland, Executive Principal Assistant Deputy Administrator for Defense Programs - National Nuclear Security Administration Jeffrey Chamberlin, Acting Deputy Administrator for Defense Nuclear Nonproliferation - National Nuclear Security Administration
Equity and Justice. Provide a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality; affirmatively advance equity, civil rights, racial justice, and equal opportunity. By September 30, 2022, DOE will introduce a survey or similar instrument to solicitations and funding opportunity	Tamia Gordon, Acting Director of the Office of Energy Justice and Equity Bari R. Brooks, Senior Advisor to the Deputy Director for Energy Justice - Office of Economic Impact and Diversity

announcements in order to collect respondent/applicant demographic data as a part of the development of a broader system of data collection across DOE acquisition space. Beginning January 1, 2022, DOE will increase directed outreach to and participation from underserved communities--including Justice40 communities, communities of color, LGBTQIA communities, women-and minority-owned businesses, and minority-serving institutions--in DOE acquisition and financial assistance activities, contributing to the overall goal of six percent of DOE obligated dollars going to SDBs by October 1, 2023, and 15% of SBIR/STTR Phase 1 awards disbursed to both women and minority-owned businesses by October 1, 2024.	
National Laboratories. Deliver the highest quality R&D and production capabilities; strengthen partnerships with industry, academia, and other key regional and national stakeholders; and revitalize and modernize the physical infrastructure of the national laboratories to enable efficient national leadership in science, technology, economic competitiveness, and national security Meet Administration priorities in two areas: advanced computing and climate change. In the strategic area of advanced computing, deliver exascale application performance across mission-critical science and engineering applications and on multiple platforms by the end of FY 2023 and establish a viable path forward for continued U.S. leadership in advanced computing. In the strategic area of climate change, by September 2023, use cross-laboratory models in the strategic areas of: (1) climate observations to support gaps in high-resolution climate models; and (2) predictive climate modeling to underpin solutions at the local scale to address climate change and environmental equity challenges.	Dr. Harriet Kung, Acting Director for Office of Science Juston Fontaine, Deputy Director for Operations for Office of Science
Electric Vehicle Charging Infrastructure deployment under Bipartisan Infrastructure Law (BIL) (Joint with DOT). Deploy Electric Vehicle Charging Infrastructure Under the Infrastructure Investment and Jobs Act: The BIL invests in the deployment of a national network of electric vehicle (EV) chargers as one of many important ways to address the climate crisis across DOT, the Department of Energy (DOE) and their newly formed Joint Office of Energy and Transportation. All three entities will support building a national network of electric vehicle chargers. This is a new APG that supports the President's BIL	Gabe Klein, Executive Director for Joint Office of Energy and Transportation Michael Berube, Deputy Assistant Secretary for Sustainable Transportation - Office of Energy Efficiency and Renewable Energy

goal of installing 500,000 EV chargers. By September 30, 2023, the Joint Office of Energy and Transportation in conjunction with DOT and DOE will complete the following critical building blocks needed for the deployment of EV charging infrastructure by: • Issuing a set of minimum standards and requirements for all EV chargers deployed under the BIL programs to ensure an affordable, reliable, accessible, and equitable EV charging network • Facilitating the development and approval of State, Puerto Rico, and District of Columbia EV charging plans to establish a cohesive national EV charging network that covers all Interstates and designated highway corridors • Distributing formula funds "National EV Infrastructure Formula Program" and awarding competitive grants under the Discretionary Grant Program for Charging and Fueling Infrastructure to eligible entities following the timeline specified in the BIL • Launching a federal EV Advisory Committee • Offering technical assistance to school districts and transit operators deploying electric school and transit buses under BIL programs.	