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# Electricity

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**Electricity**  
**(\$K)**

<b>FY 2025 Enacted</b>	<b>FY 2025 Enacted (comparable)</b>	<b>FY 2026 Enacted</b>	<b>FY 2026 Enacted (comparable)</b>	<b>FY 2027 Request</b>	<b>FY 2027 Request vs FY 2026 Enacted (comp.)</b>
280,000	339,750	235,000	259,750	203,477	-56,273

**Proposed Appropriation Language**

For Department of Energy expenses including the purchase, construction, and acquisition of plant and capital equipment, and other expenses necessary for electricity activities in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion, \$203,477,000, to remain available until expended: *Provided*, That of such amount, \$21,877,000 shall be available until September 30, 2028, for program direction: *Provided further*, That of such amount, \$20,000 from unobligated funds made available under this heading for projects specified in the table that appears under the heading “Congressionally Directed Spending Electricity Projects” in the explanatory statement described in section 4 in the matter preceding division A of Public Law 117–103 shall be available for the purposes described under this heading: *Provided further*, That of such amount, \$500,000 from unobligated funds made available under the “Electricity Delivery and Energy Reliability” heading for projects specified in the table that appears under the heading “Energy and Water Development (Congressionally Directed Spending Items)” in the joint explanatory statement accompanying the conference report on Public Law 111–85 shall be available for the purposes described under this heading: *Provided further*, That funds under this heading allocated for the purposes of section 9 of the Small Business Act, as amended (15 U.S.C. 638), including for Small Business Innovation Research and Small Business Technology Transfer activities, or for the purposes of section 1001 of the Energy Policy Act of 2005, as amended (42 U.S.C. 16391(a)), for Technology Commercialization Fund activities, may be reprogrammed without being subject to the restrictions in section 301 of this Act.

**Mission**

The Office of Electricity (OE) stabilizes, optimizes, and grows the electricity system to ensure the grid delivers affordable, reliable, and secure energy to the American people.

**Overview**

OE leads the Department’s efforts to ensure the affordability, reliability, and security of the U.S. electricity grid. The electric power sector is the cornerstone for the American economy and is essential to the quality of life, connection to family and community, and a strong job market. OE works in close partnership with States, Tribes, Territories, industry, national laboratories, and other energy sector stakeholders to lower energy costs and improve grid reliability and security. OE’s role includes research, development, demonstration, and analysis; overseeing key planning and permitting functions; and directly supporting the deployment of critical electric infrastructure nationwide.

Generating electric energy is only the first step; the ability to securely move affordable electricity from where it is produced to where and when it is needed is critical for a reliable electric grid. The electricity delivery system must accommodate all generation resources and load types while ensuring reliable, secure, and resilient grid operations under a variety of conditions. OE leads the Department’s efforts in developing new technologies and solutions to strengthen, transform, and improve electricity delivery infrastructure so all generation sources and

loads can be fully integrated into the energy ecosystem and all customers, from data centers to individual American homes, have access to reliable and affordable electricity.

A dramatic structural transformation of the electricity delivery system is underway. America's grid is transforming into a more dynamic and structurally complex system, with bidirectional power flows and rapidly changing generation and load characteristics. Managing this will require significant reengineering and advancements in grid technology and system architectures.

In FY 2027, OE will deliver electrical energy dominance through four priority goals:

- **Strengthen, enhance, and expand the electric system's capacity to reliably and affordably meet growing demand:** Scaling for new load requires coordinated actions to ensure the grid can accommodate rapid, energy-dense growth while addressing bottlenecks slowing buildout of new infrastructure. Delays to strategic expansion of the transmission system to scale for emerging demand patterns would risk slowing economic growth, increasing consumer costs, and undermining long-term grid reliability and affordability. OE advances will support maintaining system performance, expanding capacity, and improving the grid's ability to integrate new load at scale while making cost drivers more visible and aligning investment and planning decisions so that the grid can modernize and expand without placing disproportionate burdens on consumers.
- **Ensure reliability and security of the electricity grid under increasingly complex dynamic conditions:** Modernizing for reliability and security requires aligning operational tools and planning practices with a grid that is more dynamic, data rich, and heterogeneous than in past eras. OE will focus on improving operational confidence, strengthening system performance, and supporting reliable operations as technologies and conditions evolve.
- **Catalyze on-shore production and availability of critical grid components to reduce reliance on foreign suppliers:** Grid operation and modernization depend on consistent access to critical components and materials. However, many critical grid components have limited or no domestic manufacturing capacity and their supply chains face complex challenges. OE will address supply chain challenges by addressing immediate equipment constraints, promoting common configurations, and strengthening domestic capability to support long-term grid needs.
- **Accelerate innovation through the leveraging of cutting-edge scientific initiatives:** Unleashing the power of artificial intelligence and new technologies will revolutionize grid innovation. OE will leverage Departmental investments in scientific computing to catalyze breakthrough advancements in software, methods, and tools for the grid. In addition, OE will utilize the expanding knowledge base of new materials to accelerate and enhance the design and development of next-generation grid components with improved performance and reduced cost.

OE will leverage crosscutting mechanisms, such as convening, decisionmaker empowerment, application-driven use of artificial intelligence, and test beds, to support these priority objectives. OE can help build awareness of new solutions to urgent needs and quantify the expanded solution landscape, helping decisionmakers navigate to their desired energy future.

OE's team of experts share their technical, analytical, and policy expertise with offices throughout DOE and with energy stakeholders across the country. Continued program direction support is crucial to sustain a talented workforce to facilitate the Administration's goal of energy dominance and providing a reliable, resilient, secure, and affordable 21<sup>st</sup> century power grid for the American people.

**Electricity  
Funding (\$K)**

	FY 2025 Enacted	FY 2025 Enacted (comp.)	FY 2026 Enacted	FY 2026 Enacted (comp.)	FY 2027 Request	FY 2027 Request vs FY 2026 Enacted (comp.)	
						\$	%
<i>Transmission Reliability &amp; Resilience</i>	33,000	33,000	27,500	27,500	27,500	-	-
<i>Energy Delivery Grid Operations Technology</i>	31,000	31,000	31,000	31,000	34,500	+3,500	+11%
<i>Resilient Distribution Systems</i>	53,000	53,000	25,000	25,000	20,600	-4,400	-18%
<i>Cyber Resilient &amp; Secure Utility Communications Networks</i>	15,500	15,500	10,800	10,800	10,500	-300	-3%
<b>Total, Grid Controls &amp; Communications</b>	<b>132,500</b>	<b>132,500</b>	<b>94,300</b>	<b>94,300</b>	<b>93,100</b>	<b>-1,200</b>	<b>-1%</b>
<i>Energy Storage</i>	92,500	92,500	85,000	85,000	51,700	-33,300	-39%
<i>Transformer Resilience &amp; Advanced Components</i>	22,500	22,500	22,500	22,500	22,500	-	-
<i>Applied Grid Transformation Solutions</i>	13,500	13,500	13,500	13,500	10,300	-3,200	-24%
<b>Total, Grid Hardware, Components, &amp; Systems</b>	<b>128,500</b>	<b>128,500</b>	<b>121,000</b>	<b>121,000</b>	<b>84,500</b>	<b>-36,500</b>	<b>-30%</b>
Transmission Planning & Permitting	-	38,250	-	10,250	4,000	-6,250	-61%
Distribution & Markets	-	15,500	-	8,500	-	-8,500	-100%
Program Direction	19,000	25,000	19,700	25,700	21,877	-3,823	-15%
<b>Total, Electricity account</b>	<b>280,000</b>	<b>339,750</b>	<b>235,000</b>	<b>259,750</b>	<b>203,477</b>	<b>-56,273</b>	<b>-28%</b>
Transmission Planning & Permitting	38,250	-	10,250	-	-	-	-
Distribution & Markets	15,500	-	8,500	-	-	-	-
Hydropower Incentives <sup>1</sup>	250	-	250	-	-	-	-
Program Direction	6,000	-	6,000	-	-	-	-
<b>Total, Grid Deployment account</b>	<b>60,000</b>	<b>-</b>	<b>25,000</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Total</b>	<b>340,000</b>	<b>339,750</b>	<b>260,000</b>	<b>259,750</b>	<b>203,477</b>	<b>-56,273</b>	<b>-22%</b>

**DOE Realignment**

In November 2025, DOE functionally realigned ongoing program activities within the Grid Deployment Office to the Office of Electricity. In the FY 2027 Budget Request, Grid Deployment staff and programmatic work have been incorporated in the Request for the Electricity account.

Comparable columns in the funding tables above, labeled “(comparable)” or “(comp.),” reflect how the funding would have looked had Grid Deployment activities been funded within the Electricity account in all years shown.

<sup>1</sup> Hydropower Incentives activities are realigned to the Office of Critical Minerals and Energy Innovation.

The tables below show the funding allocation in the prior budget structure (in the rows) and the proposed budget structure (the columns) for FY 2025 through FY 2027.

**FY 2025 Enacted Appropriation Comparability Matrix  
(\$K)**

<b>FY 2025 &amp; FY 2026 Budget Structure</b>	<b>FY 2027 Proposed Budget Structure</b>						
	Electricity					Critical Minerals & Energy Innovation	Total
	Transmission Planning & Permitting	Distribution & Markets	Program Direction	All Other	Total, Electricity		
<i>Program Direction</i>	-	-	19,000	-	19,000	-	<b>19,000</b>
<i>All Other</i>	-	-	-	261,000	261,000	-	<b>261,000</b>
Total, Electricity	-	-	19,000	261,000	280,000	-	<b>280,000</b>
<i>Transmission Planning &amp; Permitting</i>	38,250	-	-	-	38,250	-	<b>38,250</b>
<i>Distribution &amp; Markets</i>	-	15,500	-	-	15,500	-	<b>15,500</b>
<i>Hydropower Incentives</i>	-	-	-	-	-	250	<b>250</b>
<i>Program Direction</i>	-	-	6,000	-	6,000	-	<b>6,000</b>
Total, Grid Deployment	38,250	15,500	6,000	-	59,750	250	<b>60,000</b>
<b>Total</b>	<b>38,250</b>	<b>15,500</b>	<b>25,000</b>	<b>261,000</b>	<b>339,750</b>	<b>250</b>	<b>340,000</b>

**FY 2026 Enacted Appropriation Comparability Matrix  
(\$K)**

<b>FY 2025 &amp; FY 2026 Budget Structure</b>	<b>FY 2027 Proposed Budget Structure</b>						
	Electricity					Critical Minerals & Energy Innovation	Total
	Transmission Planning & Permitting	Distribution & Markets	Program Direction	All Other	Total, Electricity		
<i>Program Direction</i>	-	-	19,700	-	19,700	-	<b>19,700</b>
<i>All Other</i>	-	-	-	215,300	215,300	-	<b>215,300</b>
Total, Electricity	-	-	19,700	215,300	235,000	-	<b>235,000</b>
<i>Transmission Planning &amp; Permitting</i>	10,250	-	-	-	10,250	-	<b>10,250</b>
<i>Distribution &amp; Markets</i>	-	8,500	-	-	8,500	-	<b>8,500</b>
<i>Hydropower Incentives</i>	-	-	-	-	-	250	<b>250</b>
<i>Program Direction</i>	-	-	6,000	-	6,000	-	<b>6,000</b>
Total, Grid Deployment	10,250	8,500	6,000	-	24,750	250	<b>25,000</b>
<b>Total</b>	<b>10,250</b>	<b>8,500</b>	<b>25,700</b>	<b>215,300</b>	<b>259,750</b>	<b>250</b>	<b>260,000</b>

**FY 2027 Request to Congress Comparability Matrix  
(\$K)**

<b>FY 2027 Proposed Budget Structure</b>				
Electricity				
<b>FY 2025 &amp; FY 2026 Budget Structure</b>	<b>Transmission Planning &amp; Permitting</b>	<b>Program Direction</b>	<b>All Other</b>	<b>Total, Electricity</b>
<i>Program Direction</i>	-	20,977	-	20,977
<i>All other</i>	-	-	177,600	177,600
<b>Total, Electricity</b>	-	20,977	177,600	198,577
<i>Transmission Planning &amp; Permitting</i>	4,000	-	-	4,000
<i>Program Direction</i>	-	900	-	900
<b>Total, Grid Deployment</b>	4,000	900	-	4,900
<b>Total</b>	<b>4,000</b>	<b>21,877</b>	<b>177,600</b>	<b>203,477</b>

## Transmission Reliability and Resilience

### Overview

The Transmission Reliability and Resilience (TRR) program collaborates with the electric industry to research, develop, and demonstrate system monitoring and diagnostics, advanced data analytics and modeling, and robust control technologies that are critically needed to assess and enhance the reliability and performance of the electricity system, mitigate large-scale blackouts, and adapt to evolving system needs, emerging risks, and interdependencies. This program is critical to realize the full potential of investments in generation technologies and growing electric loads, which are dependent on transmission capacity expansion and stability.

TRR focuses on:

- Enhancing reliable systems operations through research, development, and demonstration (RD&D) of system observability and control capabilities
- Developing and validating models, approaches, and frameworks to characterize evolving system needs and the emerging operational landscape
- Developing and demonstrating operational tools to better utilize existing transmission infrastructure and increase grid capacity
- Identifying pathways for improving grid resilience through risk-informed operational and planning tools
- Addressing ongoing industry challenges related to relay misoperations and identification and isolation of faults
- Mitigating risks across integrated energy systems through comprehensive data acquisition, augmentation, and synthesis at various scales and development of uncertainty-informed decision support systems that consider human factors

TRR brings together energy stakeholders from government, industry, academia, and national laboratories to generate novel ideas and develop transformative solutions to address the Nation's energy infrastructure challenges, including stakeholder landscape and architecture changes as well as natural and man-made hazards. TRR also fosters strategic university-based power system research, helping ensure an enduring strategic national capability for innovation in this essential area.

**Transmission Reliability and Operations (TRO)** develops transmission system operational planning and control tools to inform decisions on maintaining and improving system reliability and affordability. A key focus of the program is on transmission system measurement, control, and operations to improve grid stability and resilience. Visibility into transmission system conditions, through analytics and displays, allows operators to make risk-informed and cost-effective decisions. TRO develops tools that help system operators understand and respond to reliability events from electricity demand changes and uncertain conditions, such as wildfires, heat waves, cold snaps, and other hard-to-predict events. TRO works to modernize transmission system tools through human factors, risk science, and cognitive science research for reliable and resilient system operations. RD&D will improve the speed, accuracy, and precision of power system state determinations required to manage the increasing complexity and uncertainty of grid operations. Research will improve systems' ability to monitor and cost-effectively manage the interconnected and interdependent effects among the Nation's critical infrastructures. TRO continues to develop research datasets and data platforms that facilitate tool development with real data and reduce the burden of data requests on utilities. This sets the groundwork for catalyzing artificial intelligence and machine learning (AI/ML) in the transmission system.

**Advanced Grid Modeling (AGM)** supports building electricity sector capacity and capability to analyze the electricity delivery system using Big Data, advanced mathematical theory, and high-performance computing to assess the current state of the grid, mitigate reliability risks, and understand future needs. Since FY 2026, AGM

includes protective relaying, which identifies and isolates faults so the remaining system will continue to operate under normal conditions and reduces equipment damage and potential injuries to utility personnel and the public. AGM leads research activities to better understand issues affecting the current and future electric power grid and develop robust model-based solutions, resulting in new software and analytical toolsets for operators and planners. Successful research enables grid operators and planners to optimize decision-making, giving the electric industry sophisticated tools, capabilities, and understanding to dramatically improve electric delivery system reliability, security, and affordability. AGM plans to continue collaboration with the National Science Foundation's (NSF) Division of Mathematical Sciences on Algorithms for Modern Power Systems (AMPS) to build a community of university-level mathematicians and statisticians to solve some of the hardest power-system-related challenges.

### **Highlights of the FY 2027 Budget Request**

TRR investigates and develops technologies that make the present and future grid resilient, reliable, efficient, affordable, and secure. In FY 2027, TRR will concentrate on:

- Developing next-generation mathematical and statistical algorithms, utilizing electromagnetic transient (EMT) simulations to simulate and study a modern electrical power grid
- Exploring quantum technology application options in electric power systems
- Advancing the application of AI to grid operation and planning to improve the security, reliability, and affordability of the electric power system
- Advancing the application of cognitive science and human factors to identify and develop tools needed for robust decision making and training for system operators
- Advancing protective relaying methods to improve the functional integrity and effectiveness of proactive corrective actions to prevent misoperations and to mitigate power outages when they occur, to restore the system as quickly as possible
- Continuing research on changes to grid system dynamics with a focus on large dynamic loads such as data centers
- Supporting the development of industry standards and collaboration for wide-area situational awareness and control technologies on the transmission system
- Continuing support for the Grid Event Signature Library to facilitate the development of AI/ML tools for power sector
- Developing strategies for improving operations and operational planning across regions to advance cost-effective controls
- Identifying novel operational strategies for maintaining and improving system stability and affordability by managing uncertainty and complexity from changes in resources and loads
- Continuing the partnership with NSF on AMPS, targeting university-based research
- Developing risk-based measurement-model approaches to enable the operation of degraded or damaged electricity systems while sustaining critical functionality by improving detection, mitigation, recovery, and restoration from system issues
- Advancing transmission system tools that anticipate distribution systems operations, energy resources, and loads
- Developing and demonstrating tools with utility partners that identify, locate, and inform actions that mitigate reliability and security issues while improving affordability
- Developing training tools for operators for knowledge transfer of existing skills, and developing new skills needed for grid operations

Technology, tools, and applications developed under TRR will be evaluated for and hardened against physical and cyber security risks. Testing and evaluation will be conducted in coordination with OE's SecureNet

program to ensure that security is built into these technologies and to guard against new security risks to the electric delivery sector.

**Transmission Reliability and Resilience  
Funding (\$K)**

	<b>FY 2025 Enacted</b>	<b>FY 2026 Enacted</b>	<b>FY 2027 Request</b>
Transmission Reliability and Operations	11,700	8,700	8,700
Advanced Grid Modeling	21,300	18,800	18,800
<b>Total, Transmission Reliability and Resilience</b>	<b>33,000</b>	<b>27,500</b>	<b>27,500</b>

**Explanation of Changes for Transmission Reliability and Resilience**

*Transmission Reliability and Operations:*

- Continues core work on transmission measurement, controls, and operations to prevent power disturbances and improve system affordability and performance, including wide area situational awareness, AI/ML data support, transmission controls under uncertainty, and human factors for system operations
- Condenses activities on resilience while maintaining work on risk science

*Advanced Grid Modeling:*

- Develops next-generation mathematical and statistical algorithms utilizing EMT simulations, quantum technology and artificial intelligence to improve the security, reliability, and affordability of the electric power system.
- Supports RD&D to develop new models to increase the net power flowing through transmission lines
- Develops analytical methods to manage the impact of uncertainty to maintain the reliability, security, and affordability of the grid
- Helps the electric industry understand and maintain reliability as supply and load change to manage uncertainty and risk associated with the changing grid

## Energy Delivery Grid Operations Technology

### Overview

The Nation's energy resilience strategy can benefit from advancements in national-scale energy analytics, including short-term (operational) and long-term (infrastructure) planning capabilities, to better characterize risk and uncertainty across multiple utility and infrastructure boundaries. Built around rigorous and quantitative assessment, sensing, prediction, and deep learning, the Energy Delivery Grid Operations Technology (EDGOT) program enhances the analytical capability needed to ensure reliable and resilient energy delivery and provides the architecture and process for identifying a range of scalable mitigation solutions to manage emerging threats.

The core of the EDGOT portfolio is the North American Energy Resilience Model (NAERM). NAERM is a hybrid data/model platform for the quantitative assessment of the significant interdependencies that have evolved within the energy sector and that could affect reliability and resilience. NAERM allows for the simulation of impacts to the energy system from natural and manmade events and, through collaborative partnerships, strategic insights will be accessible to utilities and other Federal agencies. NAERM provides enhanced planning and analysis capabilities that can be leveraged to facilitate grid investments to address these threats.

NAERM activities focus on developing, enhancing, and operating the portfolio of tools needed to address grid reliability, security, and resilience in a system with pervasive and evolving threats and challenges. Starting in FY 2025, activities have been undertaken to strengthen NAERM with the capability to include a more robust economic analysis component to the tool chain. NAERM has also been improving capabilities by transitioning underlying capabilities to a robust, secure operational state, and prioritizes what-if scenarios affecting reliability and security, which is essential for maintaining OE's ability to identify and advance solutions for America's grid.

EDGOT's tools support private and public efforts by:

- Utilizing a systems perspective to compare and collectively plan for impacts across organizational, geographic, sector, and jurisdictional boundaries
- Targeting collaboration on mitigations with energy infrastructure owners and operators to effectively address multi-regional-scale natural threats and national security concerns

The EDGOT portfolio leverages previous national laboratory efforts to fully understand the resilience risks associated with the regionally diversified North American electric system and associated infrastructure systems. National laboratories, including Argonne, Idaho, Lawrence Livermore, Los Alamos, National Lab of the Rockies, Oak Ridge, Pacific Northwest, and Sandia, have a long history of developing system-wide modeling and analysis tools, as well as transformational sensing and communications technology.

### Highlights of the FY 2027 Budget Request

Predicting the impact of a specific event on energy system operations, restoration, and recovery is vexing due to the scale of the North American energy system—crossing organizational, geographic, sector, and jurisdictional boundaries—and the underlying physics of energy transport.

NAERM will analyze these interdependencies and complex events by leveraging capabilities such as:

- Use of confidential and proprietary data not available to others to drive projections on resulting impacts
- Tools and expertise to characterize and analyze the relationships between electricity and associated infrastructures, such as communications and fuel supply
- Data availability to support infrastructure grid planning across seams, including transmission, distribution, and grid-edge

The FY 2027 Request focuses on developing and enhancing the portfolio of tools to help address modeling needs and to maintain the underlying capabilities in a robust, secure operational state:

- Incorporating the best available information on threat characteristics and their evolution over time
- Hardening and integrating research innovations in advanced analytics to rapidly identify system vulnerabilities and enhance decision support for system analysis
- Developing complex multi-infrastructure contingency analyses for understanding and identifying reliability and security challenges
- Enhancing and updating the infrastructure models and facilitating their integration into the NAERM architectural framework
- Expanding NAERM’s operational capability in protecting and supporting the increase in data sources and access to NAERM
- Formalizing procedures and establishing partnerships for sharing data with industry stakeholders
- Engaging with industry stakeholders to get a better understanding of issues and practices on a regional basis to ensure that threat and consequence models are realistic and representative of actual system responses
- Supporting other government offices and agencies to assess structural, operational, and contextual changes on the power grid on a regional and national level as well as identifying mitigation approaches to potential reliability, security, and resilience concerns
- Develop and test new best practices in resource adequacy modeling that industry can use and leverage
- Supporting short- and long-term planning activities

Technology, tools, and applications developed under the EDGOT program are evaluated for security risks including cybersecurity.

**Energy Delivery Grid Operations Technology  
Funding (\$K)**

	<b>FY 2025 Enacted</b>	<b>FY 2026 Enacted</b>	<b>FY 2027 Request</b>
NAERM Operations	14,000	14,000	17,500
NAERM Upgrades	17,000	17,000	17,000
<b>Total, Energy Delivery Grid Operations Technology</b>	<b>31,000</b>	<b>31,000</b>	<b>34,500</b>

**Explanation of Changes for Energy Delivery Grid Operations Technology**

*NAERM Operations:*

- Expands NAERM use to address analytical needs from internal and external stakeholders, while protecting privileged data
- Increases the NAERM security posture to ensure protection of data and analyses
- Uses NAERM to conduct studies at the national and regional level to support DOE’s mission

*NAERM Upgrades:*

- Develops and integrates models and simulation tools, such as communication-electricity, into NAERM and enhance existing ones, such as natural gas-electricity, weather-electricity, and wildfire-electricity
- Expands data usability and system architecture, enabling easy integration of additional tools and data into NAERM
- Conducts routine studies to analyze the impact of changes to the power grid whether from natural events such as storms, wildfires, and flooding or man-made events such as physical attacks and infrastructure upgrades at the national and regional levels to support DOE's mission to ensure grid reliability, resilience, and security

## Resilient Distribution Systems

### Overview

The Resilient Distribution Systems (RDS) program focuses on research, development, and demonstration (RD&D) of grid technologies, tools, and techniques needed to maintain power to end users and coordinate information and control across segments of the electricity system, such as transmission, distribution, loads, and microgrids. RDS works to improve grid operational reliability and resilience across the electricity system. RDS also creates, shares, and disseminates information and best practices with stakeholders, including utilities, state entities, and the public. The growing convergence of transmission and distribution (T&D) systems requires new architectural, control, and operational approaches alongside a more sophisticated approach to data as a collective resource to catalyze the use of analytics, leveraging artificial intelligence (AI) and machine learning (ML). As the complexity of the electricity distribution system increases, new technologies are needed to address operational uncertainty and challenges. Utilities require new tools and capabilities to enhance observability, control, and dynamic protection across all system assets.

RDS focuses on:

- Improving reliability, resilience, affordability, and capacity of electrical power delivered to consumers through RD&D of tools and technologies that support operational coordination and integrated planning across transmission and distribution
- Lowering costs and advancing functional capabilities of microgrid solutions to ensure delivery to consumers of reliable, affordable, and secure firm power, including uninterruptible power supply to critical infrastructure
- Developing tools for effective utilization of dynamic loads and distributed assets to increase grid throughput capacity while improving power stability and power outage prevention
- Helping to develop and propagate best practices and methodologies for grid design and operations
- Identifying pathways for optimizing firm power delivery to consumers through improved transmission, distribution, and microgrid system controls and operations
- RDS pursues strategic investments in innovative technologies, tools, and practices that improve overall grid reliability, affordability, and security, while also providing grid system planners, stakeholders, and operators with better solutions for coordinating decision-making and investment strategies across grid system domains.

**Microgrid Research and Development (R&D)** advances next-generation microgrid systems through advanced technologies, methodologies, and tools to strengthen the U.S. electrical grid by boosting its capacity and flexibility, thereby enabling reliable, resilient, secure, and affordable energy delivery, and offering advanced solutions to address demand growth, particularly from large dynamic digital loads like data centers. The program focuses on providing crucial capabilities for delivering firm energy to both grid-connected and electrically remote locations to serve local demands under normal and disturbed conditions, leveraging cyber-secure intelligent controls enhanced with AI and utilizing diverse energy resources, such as advanced nuclear energy and energy storage. Additionally, advanced microgrid functionality will enable the provision of vital grid services, in some cases easing interconnection requirements. These innovations are essential for national security, ensuring the continuous operation of critical defense energy infrastructure, and bolstering U.S. energy dominance by providing uninterrupted power supply to natural gas and critical minerals mining and extraction operations. To support American technology leadership and coordinated industry adoption, the program develops comprehensive tools for microgrid valuation, planning, design, and operations. Additionally, in collaboration with industry partners, the program supports the establishment of best practices, guidelines, and technical standards for beneficial microgrid deployment.

**Dynamic Controls RD&D** investigates new control approaches and technologies to enhance the electric distribution grid's ability to harness all available resources across distribution and customer assets, reducing

transmission burdens and freeing up capital to address load growth. Operating an electric grid supporting the growing U.S. economy requires control and balancing capabilities beyond the capabilities of single owner-operators, necessitating coordination and incentivization to attract willing and capable customer-owned resources. A new data-rich environment is emerging, with data originating both within and outside traditional utility boundaries. This new environment needs expanded data science, strategy, and analytics research to increase situational awareness at the distribution level, supporting both normal operations and the ability to withstand and recover from disruptions caused by extreme weather and man-made events. Dynamic Controls also explores implications of increasing dynamic loads and other transformative grid influences.

**Electricity Delivery Systems (EDS)** works closely with State officials and the utility industry to advance practices leading to the formulation of grid investment strategies that address community, State, and Federal planning processes and serve utilities and their customers. The program examines technological and institutional issues and applies grid architecture principles and decision-making processes to address them. This includes examining resource adequacy and transmission expansion. Toward this end, EDS is advancing integrated system planning practices and developing guidelines to enable coordinated operations between transmission, distribution, and dynamic loads. The program develops reference designs to address emerging structural complexity across the electricity delivery system. These activities are meant to establish a common understanding among utilities, regulators, and their stakeholders of grid investments needed to enable the utilization of an increasingly diversified set of resources and dynamic loads while maintaining reliability, resilience, and affordability.

RDS research results enable industry to strengthen electrical infrastructure reliability and resilience and support the ongoing evolution of the electric grid. RDS is developing a U.S. Electric Sector Data Strategy to establish a framework to allow sector participants to contextualize information created and used throughout the system, enable new uses for existing and emerging data resources, and extend data sharing capabilities without sacrificing privacy or security.

### **Highlights of the FY 2027 Budget Request**

RDS R&D focuses on developing and validating new technologies and methods to improve grid reliability and resilience.

FY 2027 activities are supported in the following areas:

- Advancing microgrid integration of AI/ML capabilities to improve situational awareness, enable quasi-autonomous protection and control, optimize operational data usage, and strengthen cyber-secure operations. This activity will focus on enhancing overall microgrid system capacity to adaptively and resiliently support grid operations and local demand in real-time.
- Developing robust solutions for microgrid controller design to address engineering and operational challenges with integrated energy systems—primarily including small modular nuclear reactors (SMRs) and energy storage—to support uninterrupted firm baseload power for commercial and industrial loads (such as data centers), military and other mission-critical loads, critical minerals mining operations, and other large electrical loads.
- Continuing industry stakeholder engagement and outreach to establish technical standards, methodologies, best practices, guidelines and comprehensive toolkits for microgrid valuation, planning, design, deployment and operations—aligning R&D priorities to needs, advancing commercial readiness of advanced microgrids, empowering States and regions with key tools and information for microgrid investment decisions, and educating stakeholders on available microgrid technologies.
- Researching controls to explore the economic and reliability impacts of meeting load growth with status quo upgrades or relying on flexible resources with different control and ownership schemes.

- Researching highly resilient distribution designs accommodating evolving electricity supply and adapting to disruptions.
- Developing control and coordination approaches addressing dynamic load integration issues.
- Highlighting industry best practices and guidance on complex data sharing challenges across ownership and responsibility boundaries that assure data security, integrity, and privacy while ensuring attainment of stakeholder operational objectives.
- Developing analytics, platforms, frameworks, and tools to visualize the grid using AI/ML techniques for electric power operations and delivery—from the grid edge through the distribution system to the transmission system.
- Advancing integrated system planning practices to enable the formulation of holistic and staged grid investment strategies.
- Establishing rules to enable coordinated operations across the T&D system domains, including developing guidelines and sharing best practices to mature and standardize institutional, business, and technical processes governing the interfaces between them.
- Advancing coordinated grid decision-making, operations, and planning across community, State, and regional jurisdictions through working groups, education, and training activities in cooperation with major national energy association groups, such as the National Association of Regulatory Utility Commissioners (NARUC), National Association of State Energy Officials (NASEO), National Rural Electric Cooperative Association (NRECA), American Public Power Association (APPA), National Governors Association (NGA), National Conference of State Legislatures (NCSL), and National Association of State Utility Consumer Advocates (NASUCA).

Technology, tools, and applications developed under RDS will be evaluated, in conjunction with SecureNet testbed capabilities, for security risks including cybersecurity. Testing and evaluations will be conducted to ensure that security is built into these technologies and that new security risks are not being introduced into the electric sector.

**Resilient Distribution Systems  
Funding (\$K)**

	<b>FY 2025 Enacted</b>	<b>FY 2026 Enacted</b>	<b>FY 2027 Request</b>
Microgrids	11,500	5,000	5,500
Dynamic Controls	15,000	11,500	11,500
Sensor Data Analytics	4,500	-	-
Electricity Delivery Systems	10,000	4,000	3,600
COMMANDER National Testbed Laboratory	2,000	2,000	-
Underserved & Indigenous Community Microgrids	10,000	2,500	-
<b>Total, Resilient Distribution Systems</b>	<b>53,000</b>	<b>25,000</b>	<b>20,600</b>

**Explanation of Changes for Resilient Distribution Systems**

- Microgrids: Focuses on AI/ML integration with microgrid designs to enable enhanced capacity and other ancillary grid services as well as resilient firm energy solutions for connected load systems, while maintaining affordability; and SMR-integrated microgrid controller architectures to support mission-critical applications such as data centers, rare-earth mineral mining operations, and process industries
- Dynamic Controls: Focuses R&D efforts on distributed operational controls to support load growth and associated capacity expansion through optimization, data strategy, sector interdependencies, and system affordability
- Sensor Data Analytics: Planned activities are completed with funding provided in FY 2025

- Electricity Delivery Systems: Focuses work on multi-State grid planning practices to address regional and multi-jurisdictional issues associated with grid reliability, resilience, affordability, and flexibility requirements, especially resource adequacy, affordability, and transmission expansion
- COMMANDER National Testbed Laboratory: Planned activities will be completed with prior year funding
- Underserved & Indigenous Community Microgrids: Planned activities will be completed with prior year funding

## Cyber Resilient and Secure Utility Communications Networks (SecureNet)

### Overview

Our Nation's energy system is heavily dependent on information networks for operational reliability and resilience. While electricity consumption—from data centers, manufacturing, and other customer uses—is growing, these loads are also becoming more dynamic at scale, which can affect grid stability. Meeting these energy needs will require adding new generation, but it will also require more actively orchestrating the behavior of generation and load assets. This orchestration drives increasing grid requirements for information volume, velocity, veracity, and variety, both for situational awareness and for control and coordination messaging. Data feeds are used by human operators and automated logic, and soon will be used by artificial intelligence as well, on increasingly rapid timescales to maintain grid stability. At the same time, these distributed assets present a broader attack surface for adversaries to exploit. Modernizing communications and control systems to support end-to-end information security for real time operations, from the grid edge to the control center and back, is essential to ensure efficient, reliable, resilient, and affordable operation of the electric power system in a complex and dynamic risk landscape.

The Cyber Resilient and Secure Utility Communications Networks (SecureNet) program develops solutions to strengthen information security in the electricity delivery system through two interdependent research, development, and demonstration (RD&D) subprograms:

- Secure Communications Network RD&D focuses on securing grid data in transit: developing next-generation grid communications systems built from inception to mitigate communication failures and detect, reject, and withstand attacks on and disruptions to information flows. Key areas of research include grid communications architectures, resilient timing systems, securing heterogeneous grid networks, spectrum interference, grid communications quality of service, and new tools for grid operators to plan, build, and manage their networks.
- Grid Technology Cyber Resilience RD&D focuses on securing grid data at the points of production, processing, and application, which hardens digital grid technologies against current and future manipulation and attacks. Key areas of research include operational technology cybersecurity architectures, digital ledger technologies, digital twin applications, hardening digital interfaces for grid hardware, and cyber situational awareness for grid operators.

### Highlights of the FY 2027 Budget Request

The SecureNet program will continue to develop and validate technical solutions to strengthen electric grid communications infrastructure.

The Secure Communications Network RD&D Request includes the following core activities:

- Defining and evaluating grid communications architectures.
- Operating and further developing the Secure Pathways for Resilient Communications (SPaRC) testbed. The testbed is a resource for laboratories, utilities, industry, and communications providers to test and evaluate secure communications technologies in realistic grid environments, and a means of providing technical assistance on grid communications.
- Developing and evaluating terrestrial alternatives to GPS at the Center for Alternate Synchronization and Timing (CAST). Tool development, technical assistance, publication of testing results, and

formulation of best practices enable the electric grid to implement more robust synchronization and timing capable of operating through GPS-denied or degraded environments.<sup>1</sup>

- Engaging with industry on secure grid communications topics to align DOE RD&D activities to needs, provide validated data sources, and educate stakeholders on available technologies and best practices.

The Grid Technology Cyber Resilience RD&D Request includes the following core activities:

- Defining and evaluating operational technology cybersecurity architectures and best practices.
- Analyzing grid operational technology standards and protocols to improve reliability, resilience, and security.
- Exploring and demonstrating distributed ledger technology to support information attestation in a variety of grid use cases.
- Ensuring technologies in the OE R&D pipeline are secure by design through continued development of the Cyber Health Assessment for Resilient Grid Evolution (CHARGE) program. CHARGE provides cyber design inputs, testing capabilities, and vulnerability assessments.
- Engaging with industry to align RD&D activities to pressing needs.

**SecureNet  
Funding (\$K)**

	<b>FY 2025 Enacted</b>	<b>FY 2026 Enacted</b>	<b>FY 2027 Request</b>
Secure Communications Network RD&D	9,500	7,800	7,500
Grid Technology Cyber Resilience RD&D	6,000	3,000	3,000
<b>Total, SecureNet</b>	<b>15,500</b>	<b>10,800</b>	<b>10,500</b>

**Explanation of Changes for SecureNet**

SecureNet will continue to build and operate core program capabilities in secure communications and cybersecurity, including the SPaRC testbed. Activities will be scaled to available resources, focusing on the highest priority areas, including developing technologies for secure, end-to-end grid communications networks and addressing security challenges posed by more active participation in the grid operational environment by loads such as data centers.

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<sup>1</sup> For an overview of grid reliance on timing signals and impacts when these signals are disrupted, see DOE’s response to a NIST RFI at <https://www.nist.gov/system/files/documents/2020/07/14/pnt-0038.pdf>.

## Energy Storage

### Overview

The Energy Storage program transforms storage technologies into solutions for a reliable, resilient, secure, and affordable future-ready grid. Storage enhances the usefulness of all electricity resources, providing new tools to improve grid economics, reliability, security, and resilience, and creating new infrastructure planning options from deferral to rapid expansion.

The Budget emphasizes rapid de-risking and accelerating market readiness of new storage technologies to give Americans reliability and affordability solutions by the next year, rather than the next decade. New storage technologies tailored for more adaptable siting, added modularity, enhanced safety features, and lower cost will bring the benefits of energy storage to more people and places. As deployments grow, domain expertise, from safety and valuation to operations and decommissioning, must account for continual innovations in both new and existing storage technologies.

Energy Storage research, development, demonstration, and deployment (RDD&D) efforts seek to maximize the value of these technologies to the growing number of users and use cases, including for firm baseload power, emergency response, critical facility resilience, data center integration, affordability, and other Administration priority areas. These efforts identify foundational, leverageable, and catalytic investments through the Energy Storage Program's four primary focus areas:

- **Materials and Systems Innovation** reduces development risks and maximizes the rate at which new energy storage recipes can deliver value across the innovation ecosystem. This risk reduction incorporates storage technologies that decouple from volatile supply chains, perform reliably under wide-ranging operating conditions, scale to larger power and energy capacities, and utilize lower-cost, earth-abundant, and domestically sourced materials. Leveraging a wide portfolio of energy storage materials and technologies (such as flow batteries; solid-state batteries; sodium-, zinc-, and lead-based batteries; and thermal energy storage) provides a menu of technology options to meet consumer storage needs. Additional crosscutting R&D areas include manufacturability, interconnections, power electronics, and power conversion systems.
- **Safety and Reliability** facilitates the safe installation and operation of energy storage in more locations and for more users. Through a continuous process of research, testing, standards, and evaluation, this focus area reduces operational risks of new technologies through improved understanding and predictability of energy storage system and component operations when integrated into real-world grid conditions. Key stakeholders include fire departments and other first responders, building managers, and approving authorities and others with responsibilities for energy storage installations.
- **Analytics** helps stakeholders quantify the financial and operational benefits of energy storage. End-users, developers, utilities, regulators, and investors use OE's innovative analytical and open-source tools, performance protocols, and advanced modeling capabilities to uncover new value and benefits from advanced technologies. These capabilities are developed and disseminated through stakeholder convenings, which are vital for fostering collaboration, exchanging lessons learned, and identifying market and regulatory opportunities to maximize the affordability, reliability, and resilience benefits of energy storage.
- **Grid Integration and Field Validation** transforms the modeled benefits of energy storage into real dollars and electrons. This focus area enhances the understanding of how innovative storage systems can be effectively deployed in the field and integrated into grid operations. On-site operation of storage systems complements the use of tools and models for complex system-level analyses, determining technology operational requirements and collecting and analyzing performance data. These activities, conducted in close partnership with national laboratories, energy industry, standards organizations, and local communities, ultimately reduce operational and market risks for advanced energy storage deployment.

## Highlights of FY 2027 Budget Request

The Request supports the program's core research, development, and demonstration (RD&D) focus areas, including the application of storage technologies that support reliable firm power. Activities provide collaborative and nimble mechanisms to nurture a rapidly growing domestic energy storage innovation ecosystem. By leveraging national laboratory capabilities and with input from industry stakeholders on priority challenges, the program de-risks solid state, sodium, flow, and other emerging battery chemistries. This includes identifying key areas, from materials development to safety and deployment, that are essential for these technologies to progress towards commercialization. Targeted collaboration mechanisms for industry, academic, and community stakeholders will strategically leverage existing program-funded RD&D and ultimately accelerate progress and impact in energy storage. These activities will utilize collaboration space at the Grid Storage Launchpad (GSL) at the Pacific Northwest National Laboratory.

Increased use of energy storage across the grid and other sectors requires safe, reliable, and affordable materials and components that are sourced through secure supply chains. Materials and Systems Innovation core R&D is refocused to advance storage technology materials development and component design toward improving manufacturability, achieving system performance requirements, and facilitating interoperability of power electronics and power converter designs into additional prototype systems. These strategic risk-reduction activities will prime technology options for timely validation and commercialization.

Safety and Reliability R&D maintains foundational activities involving reliability testing, power electronics, and modeling, while optimizing remaining R&D efforts to more directly assist energy storage ecosystem stakeholders through safety education and safety standards development. Stakeholder outreach will help ensure the energy industry and local communities understand how to deploy these technologies safely. Activities will be conducted in partnership with a broad range of stakeholders, including national laboratories, the energy industry, first responders, approving authorities and others with responsibilities for energy storage installations, safety standards organizations, and communities. These activities provide utilities, local authorities, project developers, and other interested stakeholders with tools, guidance, and data. These resources will ensure energy storage deployments incorporate effective emergency response protocols and adhere to best practices for safe and cost-effective deployment and operation.

Grid Integration and Field Validation R&D refocuses core activities to de-risk innovative technologies through demonstrations and performance validation, project-based techno-economic analyses, system integration standards development, and technology integration. This work will include efforts that validate how different storage technologies can provide affordability and reliability benefits to dispatchable generation and large loads such as data centers and manufacturing facilities.

Analytics R&D will be realigned and streamlined toward affordable and reliable systems for modeling and analysis, early-stage technology assessments, technical assistance, and non-traditional, full-spectrum valuation of large-scale storage resources. Activities will refocus on continuous R&D efforts to develop open-source tools and resources, analyze storage opportunities and impacts, and assess storage performance protocols. By prioritizing two-way stakeholder engagement and development of open, unbiased informational platforms, Analytics aims to empower developers, end-users, utilities, regulators, and other decision-makers and stakeholders to implement informed strategies and create an energy landscape supporting fair, affordable, balanced, and effective energy storage participation as a tool for electricity reliability and resilience.

GSL is the first national laboratory facility focused on battery materials and battery systems for grid applications. GSL activities focus on materials development and validation of prototype battery systems (up to 100 kW systems integration and testing) to identify and solve issues early in the development cycle. GSL provides key capabilities to accelerate energy storage RD&D:

- Standardizing grid performance testing across the spectrum of battery materials, battery systems, auxiliary power, and battery management systems under market-aware and grid-specific use-case conditions

- Providing an objective national resource to report battery testing performance under grid conditions and duty cycles
- Integrating and coordinating university and national laboratory researchers to rapidly solve crosscutting science and technology challenges
- Developing new capabilities, including characterization capabilities, to rapidly scale up new materials for grid scale storage and deliver these capabilities
- Conducting realistic testing of design options in a laboratory environment

Technology, tools, and applications developed under Energy Storage will be evaluated for and hardened against physical and cyber security risks. Testing and evaluation will be conducted in coordination with OE’s SecureNet program to ensure that security is built into these technologies and to guard against new security risks to the electric delivery sector.

**Energy Storage  
Funding (\$K)**

	<b>FY 2025 Enacted</b>	<b>FY 2026 Enacted</b>	<b>FY 2027 Request</b>
Materials and Systems Innovation	32,750	32,350	18,500
Safety and Reliability	15,250	26,350	12,500
Analytics	20,600	11,150	8,500
Grid Integration and Field Validation	9,100	10,350	7,700
Grid Storage Launchpad Operations	4,800	4,800	4,500
Section 3201 Pilot Demonstration Grants	10,000	-	-
<b>Total, Energy Storage</b>	<b>92,500</b>	<b>85,000</b>	<b>51,700</b>

**Explanation of Changes for Energy Storage**

*Materials and Systems Innovation:* Materials & systems R&D is refocused to address high-priority topics, including storage technology materials development and component design toward improving manufacturability, achieving system performance requirements, and facilitating interoperability of power electronics and power converter designs into additional prototype systems. External activities to expand end-of-life/alternative life options for system materials and components, domestic supply chain innovations for access to/efficient use of materials, components, and other products used in energy storage technology, and strategic designs for improved manufacturability are reduced.

*Safety and Reliability:* R&D efforts are optimized to more directly apply findings to assist energy storage ecosystem stakeholders. This strategic shift aims to solve their specific challenges relating to key safety and reliability topic areas for energy storage. Laboratory activities will focus on safety and reliability R&D pathways for de-risking solid state, sodium, flow, and other emerging battery chemistries.

*Analytics:* Energy storage for rural resilience activities will be completed using prior year funding, enabling a strategic prioritization of support for decisionmaker access to DOE national laboratory expertise and tools, storage stakeholder convenings for information exchanges across the energy storage community, and development of open-source and advanced tools for storage analysis and investments.

*Grid Integration and Field Validation:* Support focuses on assisting storage ecosystem stakeholders in solving their challenges related to key grid integration and field validation topics. As part of this pivot, new initiatives will identify grid integration and field validation R&D pathways to de-risk solid state, sodium, flow, and other emerging battery chemistries.

*Grid Storage Launchpad Operations:* The Request maintains safety, current industry agreements, and conducting essential R&D functions, with reductions in outreach and education activities.

*Section 3201 Pilot Demonstration Grants:* Planned activities will be completed with prior year funding.

## **Transformer Resilience and Advanced Components**

### **Overview**

The Transformer Resilience and Advanced Components (TRAC) program is focused on strengthening the Nation's electricity delivery system by addressing key challenges such as aging infrastructure, evolving electrical loads including the rapid emergence of large electrical loads, and increasing needs for all grid components to withstand both system transients and extreme physical events. TRAC supports innovation and modernization to enhance the reliability, security, and affordability of critical grid infrastructure. At the same time, supply chain disruptions and global competition for materials have highlighted the risks associated with relying on foreign sources for critical grid components. TRAC is focused on developing resilient, high-performance equipment that can be manufactured using domestic materials and supply chains.

TRAC is advancing technologies that carry, control, convert, and condition electricity in ways that are smarter, faster, and more adaptable. Specific technologies include transformers, cables, conductors, high-temperature superconductors (HTS), power flow and voltage controllers, protection equipment and switchgear, and equipment sensors. By embedding data-driven design, streamlined manufacturing, and flexible system architectures, the program supports a grid that is more reliable, resilient, and affordable, and better prepared to meet the demands of a rapidly evolving energy landscape.

TRAC encompasses materials research, exploratory concepts, modeling, and analysis to address the range of challenges associated with transformers and other grid components. Program activities, developed in close coordination with industry, aim to fill fundamental research and development (R&D) gaps and accelerate the adoption of new technologies and approaches.

Flexibility is a major advantage of new critical grid components. A single large power transformer (LPT) failure can disrupt power to a half million homes. Supply chain disruptions can result in a replacement taking more than 24 months because LPTs are nearly always custom-made. Increased U.S. electricity demand is also adding an unprecedented need for distribution transformers, increasing lead times. TRAC supports innovative transformer designs that are more flexible, modular, and adaptable, enabling standardized designs to be used in more locations. This approach reduces manufacturing lead times while increasing the applicability of spare inventory. The program covers electric power transformers from LPTs to distribution service transformers, addressing issues across the entire grid.

Trends such as increasing data center demand and changes at the grid edge are introducing uncertainties in load growth projections, requiring greater grid capacity in increasingly unpredictable ways. TRAC supports innovative technologies that will help unlock additional capacity from existing assets, including grid-enhancing technologies (GETs), power flow controllers, and direct current (DC) systems that support electricity delivery and improve efficiency in many power systems, including at data centers. The Solid State Power Substation (SSPS) building block concept, reliant on advanced power electronics, will allow for nearly on-demand capacity additions or reallocations. These modular and scalable designs enable greater standardization and allow for more cost-effective capacity expansion. Additional benefits include smaller module sizes for ease of transport and lower power ratings to reduce criticality.

Data-driven approaches will be necessary for a reliable and efficient grid. For example, transmission and distribution equipment such as transformers, power lines, and substation equipment are often exposed to the elements and are vulnerable to adverse conditions. Next-generation grid hardware technologies will need to anticipate, withstand, and rapidly recover from the impact of extreme events, including terrestrial and space weather events, electrical disturbances, equipment failures, accidents, deliberate attacks, and other unknowns.

Local intelligence with embedded sensors, data processing, and communications will enable real-time health monitoring, reduced maintenance costs, and enhanced system reliability. Leveraging results from other OE activities, including sensors and emerging technologies, will improve system observability.

For the FY 2027 Budget Request, TRAC will prioritize technologies that can make the grid more reliable, affordable, and secure. These technologies include advanced transformers (solid state, flexible, and hybrid transformers, etc.), advanced power electronics, modular substations, alternative transformer core materials, and advanced transformer insulation.

**Highlights of the FY 2027 Budget Request**

The Request continues analysis, materials, and component development to enable next-generation transformers and grid equipment. Major technology focus areas include:

- *Market and System Impact Analysis:* The request supports ongoing market and system impact analyses of grid hardware, including advanced transformers, to facilitate the development of tools that reduce transformer types, thereby lowering equipment lead times, manufacturing and operational costs, and improving system reliability. This effort also supports the development of an electric grid supply chain report to proactively identify vulnerabilities and strategic solutions for grid hardware procurement.
- *Component Design and Development:* The Request supports continued device and operational improvements for SSPS technologies, including a medium voltage (MV) power electronics field demonstration. Greater utilization of medium- and high-voltage power electronic converters within substations, including hybrid and solid-state transformer applications, can provide power flow control capabilities and reactive power support, limit fault currents, and increase system flexibility and reliability. The Request continues to advance modular, scalable, flexible, and solid-state transformers from early concept prototypes systems to larger systems suitable for field validation. The Request also supports the development and testing of modular substation technologies, including innovative designs for affordable prefabricated, standardized, and rapidly deployable substation components.
- *Applied Material R&D:* The Request supports continued R&D of electrical conductors, transformer core materials, and advanced transformer insulation, as well as developing approaches to advance the recycling, reuse, and repurposing of critical grid components.

Technology, tools, and applications developed under TRAC will be evaluated for risks including physical security of electrical infrastructure, cybersecurity, electromagnetic pulses, and geomagnetic disturbances. Testing and evaluations will be conducted to ensure that security is built in and new risks are not being introduced into the electric sector.

**Transformer Resilience and Advanced Components  
Funding (\$K)**

	<b>FY 2025 Enacted</b>	<b>FY 2026 Enacted</b>	<b>FY 2027 Request</b>
Market and System Impact Analysis	3,000	3,000	3,000
Component Design and Development	16,600	16,600	16,600
Applied Material R&D	2,900	2,900	2,900
<b>Total, TRAC</b>	<b>22,500</b>	<b>22,500</b>	<b>22,500</b>

## **Explanation of Changes for Transformer Resilience and Advanced Components**

### *Market and System Impact Analysis:*

- Continues market and system analyses for different grid hardware components
- Continues advanced tool development to reduce the number of transformer specifications, and the development of an electric grid supply chain report

### *Component Design and Development:*

- Addresses grid hardware technical challenges to support growing and emerging loads such as data centers, including accelerating the development of advanced grid-scale power electronics and advanced transformers
- Continues the development of modular substation technologies

### *Applied Material R&D:*

- Continues R&D on soft magnetics for transformer cores, conductors, and dielectric materials for grid components
- Continues the development of approaches aimed at advancing the recycling, reuse, and repurposing of grid components

## Applied Grid Transformation Solutions

### Overview

The Applied Grid Transformation Solutions (AGTS) program tests and validates innovative grid technologies prior to their deployment in the field, increases awareness of advanced grid solutions that can meet pressing industry needs, and drives standards that promote U.S. leadership, innovations, and grid technologies in global markets. Modernizing the grid to broaden reliability, resilience, and security while maintaining affordability requires significant reengineering of system architectures, development of appropriate requirements and standards, and well-informed adoption of advanced grid solutions. By assembling and enhancing testbed capabilities to stress test advanced grid technologies and identify performance limitations; methodically assessing pilot demonstrations in integrated and operational environments to document best practices, requirements, and capability gaps; and developing decision-making tools and resources for a variety of stakeholders, AGTS provides industry with the data, insights, and support to inform grid transformation, assess infrastructure investments, and advance U.S. interests and influence in critical grid supply chains.

*Transformation Toolkit:* The speed of innovation and change facing the electric grid is overwhelming decision makers, especially around different technologies and options that can provide similar benefits. The information available for consideration is vast, unstructured, and diverse due to the various objectives, approaches, and processes for different technologies in different states, regions, and jurisdictions across the United States. Information asymmetry between utilities and regulators leads to suboptimal solutions and slows adoption of beneficial grid technologies that can meet pressing industry needs. OE is a trusted entity that can serve as a clearinghouse for technical information, including emerging standards, and an unbiased evaluator of options to facilitate grid transformation.

The Transformation Toolkit subprogram focuses on developing tools, resources, and programs to empower grid stakeholders with actionable information. Activities include documenting best practices, baselining technology readiness, providing technical assistance, supporting U.S. engagement in standards development processes to counter foreign influence, and compiling outputs and impacts of OE and DOE grid R&D investments.

*Testbed Network:* Grid testbeds are vital tools in the technology development process, providing capabilities to evaluate innovative technologies in a controlled and realistic environment prior to integration with operational assets and systems in the field. Stress tests help evaluate technology performance, reliability, safety, and security under blue sky, grey sky, and black sky conditions and can surface technical and capability gaps that may require further R&D efforts. While industry has established testing facilities, they are facing capacity and capability limitations due to historic underinvestment after most grid technology manufacturing moved overseas. These limitations impose time and cost constraints that the industry can't afford, especially for small businesses and innovators. Facility upgrades and advanced testbeds are also needed to evaluate new grid hardware and software technologies, such as grid power electronics and AI operator tools. Investments in grid test facilities and increasing access to their capabilities is vital for the United States to exert global leadership in next-generation grid technology innovations.

The Testbed Network subprogram focuses on identifying and assembling needed grid testbed facilities across the Nation to test, validate, and evaluate advanced grid technologies. By leveraging and connecting unique capabilities at national laboratories, private sector facilities, and academic testbeds, industry will have a coordinated platform to support testing and validation of innovative grid technologies for a variety of use cases and scales while minimizing redundant investments. Activities also include bridging capability gaps, facilitating access to testing resources to bolster local grid innovation ecosystems, and supporting testing to inform standards that help advance U.S. energy, economic, and national security objectives.

*Strategic Pilots and Evaluation:* Pilot demonstrations of innovative grid technologies are often required prior to broader implementation since benefits are difficult to quantify when tested in isolation and results are difficult to extrapolate to real utility systems. Due to variations across jurisdictional boundaries, different utilities frequently conduct their own pilots for the same or similar technology. While there are unique characteristics of each project, there are also commonalities and shared learning that can shorten, reduce, or obviate the need for some utility pilots. The current practice is a suboptimal use of ratepayer and taxpayer dollars and slows adoption of beneficial grid technologies that can meet pressing industry needs. Systematic assessment and evaluation of pilot demonstrations will yield actionable information desired by utilities and regulators, such as project use cases, technology performance, integration and operational requirements, cyber-physical security requirements, relevant standards, and quantified economic benefits.

The Strategic Pilots and Evaluation subprogram focuses on assessing pilot demonstrations that fill strategic knowledge gaps; integrating innovations into operational environments to identify R&D needs; and systematically documenting project results to inform scaling, replication, and/or extension. Activities include establishing evaluation frameworks based on grid architecture to chart transformation and conducting strategic pilot demonstrations that combine synergistic technologies and innovations to provide enhanced value.

### Highlights of the FY 2027 Budget Request

- Enhance at least one grid testbed capability in collaboration with national laboratories, private industry, and academia to evaluate and stress test advanced grid technologies such as AI tools for operational environments, advanced transformers, sensors and equipment condition monitoring solutions, and medium voltage (MV) grid power electronics systems and solutions
- Continue industry engagement to share information, gather technology adoption insights and best practices, and identify new grid technology testing and validation needs.
- Apply grid architecture assessment and documentation frameworks to pilot demonstrations to systematically evaluate benefits and scalability.

AGTS is inherently crosscutting and coordinates its activities with other OE programs and DOE offices on shared technology development needs, objectives, and results. Testing and evaluation activities will be coordinated with OE’s SecureNet program to ensure security is built into technologies and to guard against new security risks to the electric delivery sector.

### Applied Grid Transformation Solutions Funding (\$K)

	<b>FY 2025 Enacted</b>	<b>FY 2026 Enacted</b>	<b>FY 2027 Request</b>
Transformation Toolkit	2,000	2,000	2,000
Testbed Network	5,500	5,500	4,500
Strategic Pilots and Evaluation	6,000	6,000	3,800
<b>Total, AGTS</b>	<b>13,500</b>	<b>13,500</b>	<b>10,300</b>

## **Explanation of Changes for Applied Grid Transformation Solutions**

*Transformation Toolkit* focuses efforts on disseminating tools and resources for decision-making support to facilitate adoption of beneficial solutions.

*Testbed Network* focuses testing activities on testbed enhancements aligned with standards development processes to counter foreign dependence and influence.

*Strategic Pilots and Evaluation* reduces support for new pilot demonstrations and focuses efforts on assessment.

# Transmission Planning and Permitting

## Overview

The Transmission Planning and Permitting (TPP) program accelerates the build-out and modernization of the Nation's electric grid to secure American energy dominance while making electricity more affordable to Americans.

Large-scale electricity demand growth is occurring at a pace and scale that presents significant challenges to the U.S. electric grid. In several regions, planned and proposed data centers, semiconductor fabrication plants, manufacturing facilities, and other large loads are driving multi-gigawatt increases in electric demand. Many of these new loads are highly location-specific, have accelerated timelines, and depend on rapid interconnection of reliable electricity supply. This growth has exposed gaps in existing infrastructure, including limited transmission capacity, grid congestion, aging grid infrastructure, and delays in interconnection processes for both load and new generation. Long-lead times for transmission and generation development, along with regulatory, permitting, planning, and operational challenges, are threatening the ability of critical projects to meet demand.

TPP supports activities encouraging development of needed transmission capacity to meet projected electricity demand growth that has significantly outpaced existing electric grid capacity growth. The program provides technical assistance addressing urgent challenges and opportunities. Challenges include aging electric infrastructure that struggles to meet modern electricity needs, increasing natural disasters including wildfires, heat domes, polar vortexes, and the evolving demands of the electric grid, particularly from artificial intelligence, data centers, and increased manufacturing. Improving energy affordability is an opportunity for TPP to ensure that the costs of meeting those challenges are not passed down to residential consumers, holding large load users, such as data centers, accountable for their infrastructure costs. In addition, technical assistance to improve transmission siting and permitting processes helps unlock the Nation's energy resources to grow the grid. Increasing transmission capacity and improving siting and permitting can provide greater certainty to drive investment in the highest-need transmission projects, which will reduce electricity costs for consumers. This unleashing of American energy will make the grid more affordable, reliable, and secure for the American people.

## Highlights of the FY 2027 Budget Request

The FY 2027 Request prioritizes technical assistance to optimize planning, siting, and permitting processes to accelerate transmission buildout for an affordable, reliable, and secure grid.

TPP works with experts around the country, including the national laboratories and Power Marketing Administrations, to provide data, tools, analyses, and other solutions to address the challenges and opportunities to unleash American energy. Technical assistance to energy system stakeholders is expected to become increasingly critical as the electricity demand outpaces electricity capacity, and affordability issues and reliability imperatives drive States to take on a greater role in transmission and energy system planning and analysis.

In FY 2027, TPP’s technical assistance will focus on:

- *Resource Adequacy* supporting efforts to ensure the availability of reliable generation and transmission capacity to support energy resource adequacy,
- *Reconductoring* encouraging the deployment of advanced transmission technologies, including advanced conductors and grid enhancing technologies that maximize the use of existing transmission assets, and
- *Affordability* ensuring that energy affordability remains a high priority while increasing transmission capacity to meet growing demand.

In the FY 2027 Request, TPP will continue to execute its legal responsibilities for authorizing the export of electric energy, permitting the construction of transmission infrastructure across international borders, and helping better coordinate permitting of transmission on Federal lands. TPP will also continue efforts for the statutorily mandated triennial Transmission Needs Study.

**Transmission Planning and Permitting  
Funding (\$K)**

	<b>FY 2025 Enacted</b>	<b>FY 2025 Enacted (comp.)</b>	<b>FY 2026 Enacted</b>	<b>FY 2026 Enacted (comp.)</b>	<b>FY 2027 Request</b>
Technical Assistance	-	17,750	-	5,250	4,000
Interregional Planning and Development	-	16,000	-	5,000	-
Offshore Wind Planning and Development	-	4,500	-	-	-
<b>Total, Transmission Planning and Permitting</b>	-	<b>38,250</b>	-	<b>10,250</b>	<b>4,000</b>

In November 2025, DOE functionally realigned program activity from the Grid Deployment Office to the Office of Electricity. In the FY 2027 Budget Request, Grid Deployment programmatic work has been incorporated in the Request for the Electricity account. Comparable FY 2025 and FY 2026 columns in the table above, labeled “(comp.),” reflect how the funding would have looked had it been within the Electricity account in all years shown.

**Explanation of Changes for Transmission Planning and Permitting**

- *Technical Assistance*: The reduction streamlines and prioritizes technical assistance activities to better meet Administration priorities to unleash American energy.
- *Interregional Planning and Development*: Interregional transmission planning and development activities are refocused and streamlined into the Technical Assistance subprogram for greater efficiency and flexibility.
- *Offshore Wind Planning and Development*: No activities are requested for offshore wind transmission planning and development work in FY 2027.

## Distribution and Markets

### Overview

No funding is requested in FY 2027 for the Distribution and Markets program. Prior work helped electricity system partners and stakeholders establish and improve centrally organized market components and bilateral market arrangements as well as advance distribution-level market opportunities to improve the grid.

### Distribution and Markets Funding (\$K)

	FY 2025 Enacted	FY 2025 Enacted (comp.)	FY 2026 Enacted	FY 2026 Enacted (comp.)	FY 2027 Request
Wholesale Markets Technical Assistance & Grants	-	8,000	-	6,000	-
DER Grid Planning & Markets	-	2,000	-	-	-
Territory, Tribal, & Rural Community Development	-	5,500	-	-	-
PUC & RTO TA, Support, & Guidance on Models, Rates, & Market Designs Integrating LDES	-	-	-	2,500	-
<b>Total, Distribution and Markets</b>	-	<b>15,500</b>	-	<b>8,500</b>	-

In November 2025, DOE functionally realigned program activity from the Grid Deployment Office to the Office of Electricity. In the FY 2027 Budget Request, Grid Deployment programmatic work has been incorporated in the Request for the Electricity account. Comparable FY 2025 and FY 2026 columns in the table above, labeled “(comp.),” reflect how the funding would have looked had it been within the Electricity account in all years shown.

### Explanation of Changes for Distribution and Markets

No funding is requested for Distribution and Markets in FY 2027. Prior-year funded activities will be completed using already appropriated funding.

## **Program Direction**

### **Overview**

The Program Direction (PD) program provides for the Federal workforce responsible for the overall direction and administrative support of the Office of Electricity (OE). Headquarters Federal employees provide executive management, programmatic oversight, and analysis for the effective implementation of the OE program, as well as communications, finance, operations, planning, and workforce development functions. PD funding is also provided for time spent by Office of Fossil Energy (FE) technical staff at the National Energy Technology Laboratory (NETL) in support of OE's financial activities, including procurement, finance, and legal functions.

Contractor support services are utilized for some administrative tasks and special purpose analyses for management, such as technology and market analyses and development of tools to improve overall office efficiency, consolidate organizational knowledge, track performance and inventory data, and facilitate staff use of the information. Other related PD expenses include corporate IT support and equipment through DOE's Energy Information Technology Services (EITS), Office of Research, Technology, and Economic Security (RTES) reviews, and common administrative services such as rent for office space leased from the General Services Administration, telecommunications, and corporate business systems through DOE's Working Capital Fund (WCF).

### **Highlights of the FY 2027 Budget Request**

OE's team of experts share their technical, analytical, and policy expertise with offices throughout DOE and with energy stakeholders across the country. Continued program direction support is crucial to sustain a talented workforce to facilitate the Administration's goal of energy dominance and providing a reliable, resilient, secure, and affordable 21st century power grid for the American people.

### **DOE Realignment**

In November 2025, DOE functionally realigned ongoing program activities within the Grid Deployment Office to the Office of Electricity. In the FY 2027 Budget Request, Grid Deployment staff and programmatic work have been incorporated in the Request for the Electricity account. Comparable columns in the funding tables, labeled "(comparable)" or "(comp.)," reflect how the funding would have looked had Grid Deployment activities been funded within the Electricity account in all years shown.

**Program Direction  
Funding (\$K)**

	<b>FY 2025 Enacted</b>	<b>FY 2025 Enacted (comp.)</b>	<b>FY 2026 Enacted</b>	<b>FY 2026 Enacted (comp.)</b>	<b>FY 2027 Request</b>
Salaries and Benefits	11,715	15,019	10,727	11,692	12,135
Travel	92	116	360	420	400
Support Services	2,674	3,008	1,035	3,249	1,721
Other Related Expenses	1,577	3,391	4,243	5,202	3,569
<b>Total, Washington Headquarters</b>	<b>16,058</b>	<b>21,534</b>	<b>16,365</b>	<b>20,563</b>	<b>17,825</b>
Salaries and Benefits	1,723	1,934	1,709	3,199	2,417
Travel	2	3	45	46	47
Support Services	388	388	383	694	398
Other Related Expenses	829	1,141	1,198	1,198	1,190
<b>Total, NETL</b>	<b>2,942</b>	<b>3,466</b>	<b>3,335</b>	<b>5,137</b>	<b>4,052</b>
Salaries and Benefits	13,438	16,953	12,436	14,891	14,552
Travel	94	119	405	466	447
Support Services	3,062	3,396	1,418	3,943	2,119
Other Related Expenses	2,406	4,532	5,441	6,400	4,759
<b>Total, Program Direction</b>	<b>19,000</b>	<b>25,000</b>	<b>19,700</b>	<b>25,700</b>	<b>21,877</b>
Technical Support	1,901	1,600	908	1,903	1,314
Management Support	1,161	1,796	510	2,040	805
<b>Total, Support Services</b>	<b>3,062</b>	<b>3,396</b>	<b>1,418</b>	<b>3,943</b>	<b>2,119</b>
EITS Desktop Services	438	814	594	936	824
WCF	1,139	2,525	2,190	2,725	2,745
Other Services	829	1,193	2,657	2,739	1,190
<b>Total, Other Related Expenses</b>	<b>2,406</b>	<b>4,532</b>	<b>5,441</b>	<b>6,400</b>	<b>4,759</b>
OE Federal FTEs	50	71	47	51	51
Additional FE Federal FTEs at NETL supporting OE <sup>1</sup>	12	12	11	12	11
<b>Total OE-funded FTEs</b>	<b>62</b>	<b>83</b>	<b>58</b>	<b>63</b>	<b>62</b>

<sup>1</sup> OE funds FE FTEs at NETL that support OE activities. The NETL FTEs are included in FE's FTE totals and not in the OE FTE totals shown on the "Federal FTEs" line.

**Program Direction  
Activities and Explanation of Changes  
(\$K)**

FY 2026 Enacted (comp.)	FY 2027 Request	Explanation of Changes FY 2027 Request vs FY 2026 Enacted (comp.)
<b>Program Direction</b>		
<b>25,700</b>	<b>21,877</b>	<b>-3,823</b>
<i>Salaries and Benefits</i>		
<i>14,891</i>	<i>14,552</i>	<i>-339</i>
Support 63 FTEs providing executive management, programmatic oversight, and analysis for the effective implementation of the OE program	Support 62 FTEs providing executive management, programmatic oversight, and analysis for the effective implementation of the OE program	Funding reflects 1 fewer FTE.
<i>Travel</i>		
<i>466</i>	<i>447</i>	<i>-19</i>
Funds transportation, subsistence, and incidental expenses allowing OE to effectively facilitate its mission	Funds transportation, subsistence, and incidental expenses allowing OE to effectively facilitate its mission	Planned travel is reduced
<i>Support Services</i>		
<i>3,943</i>	<i>2,119</i>	<i>-1,824</i>
Includes contractor support directed by Federal staff to perform administrative tasks and provide analysis to management	Includes contractor support directed by Federal staff to perform administrative tasks and provide analysis to management	Savings resulted from merging OE and GDO through consolidation of functions previously performed independently.
May also include support for post-doctoral fellows and IPA assignments	May also include support for post-doctoral fellows and IPA assignments	
<i>Other Related Expenses</i>		
<i>6,400</i>	<i>4,759</i>	<i>-1,641</i>
Includes EITS desktop services and equipment upgrades and replacements	Includes EITS desktop services and equipment upgrades and replacements	Savings resulted from merging OE and GDO through reductions in conference fees, training, construction, furniture purchases, and other activities.
WCF expenses include rent, supplies, copying, graphics, mail, printing, and telephones	WCF expenses include rent, supplies, copying, graphics, mail, printing, and telephones	

**DEPARTMENT OF ENERGY**  
**Funding by Site Detail**  
TAS\_0318 - Electricity - FY 2027  
(Dollars in Thousands)

FY 2025 Enacted	FY 2026 Enacted	FY 2027 Request
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**Argonne National Laboratory**

Transmission Reliability and Resilience	1,990	1,800	1,500
Energy Delivery Grid Operations Technology	2,509	2,491	2,500
Resilient Distribution Systems	2,395	0	0
Grid Controls and Communications	6,894	4,291	4,000
Energy Storage R&D	2,015	1,345	1,345
Energy Storage	2,015	1,345	1,345
Transformer Resilience and Advanced Components	2,000	2,500	2,500
Applied Grid Transformation Solutions	320	0	0
Grid Hardware, Components, and Systems	4,335	3,845	3,845
Transmission Planning & Permitting	1,000	0	0
<b>Total Argonne National Laboratory</b>	<b>12,229</b>	<b>8,136</b>	<b>7,845</b>

**Brookhaven National Laboratory**

Transmission Reliability and Resilience	800	950	1,000
Grid Controls and Communications	800	950	1,000
Energy Storage R&D	300	0	0
Energy Storage	300	0	0
Transformer Resilience and Advanced Components	800	0	0
Grid Hardware, Components, and Systems	1,100	0	0
<b>Total Brookhaven National Laboratory</b>	<b>1,900</b>	<b>950</b>	<b>1,000</b>

**Idaho National Laboratory**

Transmission Reliability and Resilience	950	850	800
Resilient Distribution Systems	1,035	0	0
Cyber Resilient & Secure Utility Communications Network (SecureNet)	3,315	1,500	1,500
Grid Controls and Communications	5,300	2,350	2,300
Energy Storage R&D	50	0	0
Energy Storage	50	0	0
Transformer Resilience and Advanced Components	800	2,500	2,500
Applied Grid Transformation Solutions	805	1,500	0
Grid Hardware, Components, and Systems	1,655	4,000	2,500
Distribution & Markets	1,000	0	0
<b>Total Idaho National Laboratory</b>	<b>7,955</b>	<b>6,350</b>	<b>4,800</b>

**Lawrence Berkeley National Laboratory**

Transmission Reliability and Resilience	950	900	1,000
Energy Delivery Grid Operations Technology	156	250	500
Resilient Distribution Systems	6,125	4,450	3,300
Grid Controls and Communications	7,231	5,600	4,800
Energy Storage R&D	374	0	0
Energy Storage	374	0	0

**DEPARTMENT OF ENERGY**  
**Funding by Site Detail**  
TAS\_0318 - Electricity - FY 2027  
(Dollars in Thousands)

	<b>FY 2025 Enacted</b>	<b>FY 2026 Enacted</b>	<b>FY 2027 Request</b>
Applied Grid Transformation Solutions	1,480	700	50
Grid Hardware, Components, and Systems	1,854	700	50
Transmission Planning & Permitting	2,000	0	0
<b>Total Lawrence Berkeley National Laboratory</b>	<b>11,085</b>	<b>6,300</b>	<b>4,850</b>
<b>Lawrence Livermore National Laboratory</b>			
Transmission Reliability and Resilience	4,413	2,350	1,500
Energy Delivery Grid Operations Technology	9,494	7,066	7,200
Resilient Distribution Systems	473	0	0
Grid Controls and Communications	14,380	9,416	8,700
Energy Storage R&D	1,000	0	0
Energy Storage	1,000	0	0
Applied Grid Transformation Solutions	35	0	0
Grid Hardware, Components, and Systems	1,035	0	0
Transmission Planning & Permitting	1,000	0	0
<b>Total Lawrence Livermore National Laboratory</b>	<b>16,415</b>	<b>9,416</b>	<b>8,700</b>
<b>Los Alamos National Laboratory</b>			
Transmission Reliability and Resilience	1,185	1,100	1,200
Energy Delivery Grid Operations Technology	3,461	3,189	3,300
Resilient Distribution Systems	1,403	0	0
Grid Controls and Communications	6,049	4,289	4,500
Transformer Resilience and Advanced Components	900	800	800
Grid Hardware, Components, and Systems	900	800	800
<b>Total Los Alamos National Laboratory</b>	<b>6,949</b>	<b>5,089</b>	<b>5,300</b>
<b>National Energy Technology Lab</b>			
Energy Delivery Grid Operations Technology	150	0	0
Grid Controls and Communications	150	0	0
Transmission Planning & Permitting	5,000	7,500	1,000
Distribution & Markets	8,000	7,000	0
Program Direction - OE	3,164	1,866	3,607
<b>Total National Energy Technology Lab</b>	<b>16,314</b>	<b>16,366</b>	<b>4,607</b>
<b>National Laboratory of the Rockies</b>			
Transmission Reliability and Resilience	2,363	1,000	1,200
Energy Delivery Grid Operations Technology	1,653	2,486	2,500
Resilient Distribution Systems	6,982	980	850
Grid Controls and Communications	10,998	4,466	4,550
Energy Storage R&D	553	500	500
Energy Storage	553	500	500
Transformer Resilience and Advanced Components	3,300	4,000	4,000
Applied Grid Transformation Solutions	1,660	0	0
Grid Hardware, Components, and Systems	5,513	4,500	4,500

**DEPARTMENT OF ENERGY**  
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(Dollars in Thousands)

Transmission Planning & Permitting	15,000	1,000	1,500
Distribution & Markets	1,000	750	0
<b>Total National Laboratory of the Rockies</b>	<b>32,511</b>	<b>10,716</b>	<b>10,550</b>

**Oak Ridge National Laboratory**

Transmission Reliability and Resilience	6,771	6,375	5,000
Energy Delivery Grid Operations Technology	1,746	829	2,000
Resilient Distribution Systems	3,971	4,470	2,800
Cyber Resilient & Secure Utility Communications Network (SecureNet)	4,385	4,000	4,000
Grid Controls and Communications	16,873	15,674	13,800
Energy Storage R&D	3,900	2,616	2,616
Energy Storage	3,900	2,616	2,616
Transformer Resilience and Advanced Components	3,450	4,000	4,000
Applied Grid Transformation Solutions	3,819	300	300
Grid Hardware, Components, and Systems	11,169	6,916	6,916
Transmission Planning & Permitting	1,000	0	0
<b>Total Oak Ridge National Laboratory</b>	<b>29,042</b>	<b>22,590</b>	<b>20,716</b>

**Pacific Northwest National Laboratory**

Transmission Reliability and Resilience	6,551	4,340	2,000
Energy Delivery Grid Operations Technology	6,080	7,438	7,500
Resilient Distribution Systems	15,560	13,440	12,000
Cyber Resilient & Secure Utility Communications Network (SecureNet)	2,574	3,500	3,500
Grid Controls and Communications	30,765	28,718	25,000
Energy Storage R&D	21,024	19,832	19,832
Energy Storage	21,024	19,832	19,832
Transformer Resilience and Advanced Components	1,800	2,500	2,500
Applied Grid Transformation Solutions	565	500	0
Grid Hardware, Components, and Systems	23,389	22,832	22,332
Transmission Planning & Permitting	4,000	1,000	1,000
Distribution & Markets	1,000	750	0
<b>Total Pacific Northwest National Laboratory</b>	<b>59,154</b>	<b>53,300</b>	<b>48,332</b>

**Sandia National Laboratories**

Transmission Reliability and Resilience	5,205	2,250	1,000
Energy Delivery Grid Operations Technology	5,125	3,731	3,800
Resilient Distribution Systems	2,442	0	0
Cyber Resilient & Secure Utility Communications Network (SecureNet)	0	1,000	1,000
Grid Controls and Communications	12,772	6,981	5,800
Energy Storage R&D	25,104	19,391	19,391
Energy Storage	25,104	19,391	19,391
Transformer Resilience and Advanced Components	7,150	5,000	5,000
Applied Grid Transformation Solutions	2,435	0	0

**DEPARTMENT OF ENERGY**  
**Funding by Site Detail**  
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(Dollars in Thousands)

Grid Hardware, Components, and Systems	34,689	24,391	24,391
<b>Total Sandia National Laboratories</b>	<b>47,461</b>	<b>31,372</b>	<b>30,191</b>

**Savannah River National Laboratory**

Transformer Resilience and Advanced Components	1,200	800	800
Grid Hardware, Components, and Systems	1,200	800	800
<b>Total Savannah River National Laboratory</b>	<b>1,200</b>	<b>800</b>	<b>800</b>

**SLAC National Accelerator Laboratory**

Energy Storage R&D	2,000	1,000	1,000
Energy Storage	2,000	1,000	1,000
Grid Hardware, Components, and Systems	2,000	1,000	1,000
<b>Total SLAC National Accelerator Laboratory</b>	<b>2,000</b>	<b>1,000</b>	<b>1,000</b>

**Washington Headquarters**

Transmission Reliability and Resilience	10	0	0
Resilient Distribution Systems	20	0	0
Grid Controls and Communications	30	0	0
Energy Storage R&D	16,937	16,138	6,713
Energy Storage	16,937	16,138	6,713
Grid Hardware, Components, and Systems	16,937	16,138	6,713
Transmission Planning & Permitting	4,000	750	500
Distribution & Markets	2,000	0	0
Program Direction - OE	17,114	5,375	0
<b>Total Washington Headquarters</b>	<b>40,081</b>	<b>22,263</b>	<b>7,213</b>

**Other**

Transmission Reliability and Resilience	521	2,230	1,100
Energy Delivery Grid Operations Technology	233	0	0
Resilient Distribution Systems	1,626	1,650	1,650
Cyber Resilient & Secure Utility Communications Network (SecureNet)	2,900	0	0
Grid Controls and Communications	5,280	3,880	2,750
Energy Storage R&D	1,929	1,140	303
Energy Storage	1,929	1,140	303
Transformer Resilience and Advanced Components	100	400	400
Applied Grid Transformation Solutions	669	500	500
Grid Hardware, Components, and Systems	2,698	2,040	1,203
Program Direction - OE	3,854	13,773	17,346
<b>Total Other</b>	<b>11,832</b>	<b>19,693</b>	<b>21,299</b>

**Undesignated LPI**

Transmission Reliability and Resilience	1,291	3,355	10,200
Energy Delivery Grid Operations Technology	393	3,520	5,200
Resilient Distribution Systems	10,968	10	0
Cyber Resilient & Secure Utility Communications Network (SecureNet)	2,326	800	500
Grid Controls and Communications	14,978	7,685	15,900

**DEPARTMENT OF ENERGY**  
**Funding by Site Detail**  
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(Dollars in Thousands)

Energy Storage R&D	17,314	23,038	0
Energy Storage	17,314	23,038	0
Transformer Resilience and Advanced Components	1,000	0	0
Applied Grid Transformation Solutions	1,712	10,000	9,450
Grid Hardware, Components, and Systems	20,026	33,038	9,450
Transmission Planning & Permitting	5,250	0	0
Distribution & Markets	2,500	0	0
Program Direction - OE	868	4,686	924
<b>Total Undesignated LPI</b>	<b>43,622</b>	<b>45,409</b>	<b>26,274</b>
<b>Total Funding by Site for TAS_0318 - Electricity</b>	<b>339,750</b>	<b>259,750</b>	<b>203,477</b>