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November 21, 2025

Department of Energy
Grid Deployment Office
1000 Independence Ave. SW
Washington, DC 20585
SpeedtoPowerRFI@hq.doe.gov

Re: RFI Response—Accelerating Speed to Power

Dear Grid Deployment Office,

The National Electrical Manufacturers Association (NEMA) represents over 300 electrical equipment manufacturers that make safe, reliable, and efficient products and technologies that power, connect, and light our world. Together, our members contribute a full 1% of U.S. GDP and directly provide over 580,000 American jobs, adding more than $330 billion to the U.S. economy. Learn more at makeitelectric.org.

NEMA submits this letter in response to the Department of Energy's Request for Information (RFI) entitled, "Accelerating Speed to Power/Winning the Artificial Intelligence Race: Federal Action To Rapidly Expand Grid Capacity and Enable Electricity Demand Growth." Thank you for this opportunity for NEMA, on behalf of our members, to provide input on strategies to rapidly expand grid capacity and enable electricity demand growth for manufacturing, industrial, and AI/data center sectors. Grid modernization is not only a technical imperative but a strategic necessity for U.S. economic competitiveness and energy dominance.

I. Executive Summary

NEMA's members are at the forefront of deploying technologies and solutions that can accelerate "speed to power" and support the nation's economic and technological leadership. In response to DOE's RFI, we recommend a dual-path strategy: (1) Incentivizing investment to increase the production capacity of components, systems, and equipment required for the buildout of the electric grid's baseload generation, transmission, and distribution systems, and (2) Unlocking near-term grid capacity through scalable, commercially available equipment and digital solutions.

NEMA's recently published *Grid Reliability Study* projects that U.S. electricity demand will grow by over 50% by 2050, with data center consumption rising by 300%.[1] These projections are likely conservative as the rate of growth in data center energy demand has continued to accelerate since the study was completed. Meeting this demand requires urgent investment in grid technologies, regulatory certainty, flexible and resilient infrastructure, streamlined permitting, robust domestic manufacturing, and coordinated public-private action. To ensure speed is matched by affordability

[1] The study was completed in January 2025. It is available at https://www.nema.org/docs/default-source/default-document-library/public/pa-nema-grid-flexibility-study.pdf.

and durable execution, DOE should also coordinate closely with state leadership and regulators to align economic-development siting decisions with grid expansion plans, share data on large-load corridors, synchronize funding and permitting across jurisdictions, and address grid interconnection bottlenecks.

NEMA and our members stand ready to partner with DOE to deliver solutions that address both immediate and long-term grid challenges.

II. Key Recommendations

A. Demand-Side Flexibility & Distributed Energy Resource (DER) Aggregation

Aggregated and optimized distributed energy resources (DERs) represent a transformative approach to grid management, enabling utilities and grid operators to harness the flexibility and responsiveness of grid edge assets, such as rooftop solar, battery storage, smart thermostats, self-generation, and electric vehicle charging. By integrating "smart grid" technologies to connect these resources into coordinated platforms, operators can dynamically adjust supply and demand, respond to grid contingencies, and maximize energy flows in real time. This aggregation allows for the orchestration of thousands of individual devices as a "virtual power plant," providing valuable services such as frequency regulation, voltage support, and load shifting.

Centralized coordination of DERs has demonstrated significant system-wide benefits. Studies show that widespread deployment and management of DERs can reduce transformer violations from 81% to 28% by 2050 and shave up to 17% off peak load.[2] These improvements not only strengthen grid performance and reliability, but also defer the need for costly infrastructure upgrades, such as new substations or transmission lines. By reducing peak demand and alleviating stress on grid assets, DERs help utilities reduce capital expenditures and extend the lifespan of existing and legacy equipment.

Beyond operational advantages, DER integration delivers direct financial benefits to consumers and communities. Households and businesses participating in DER programs can earn incentives for demand response, reduce their energy bills through self-generation and storage, and contribute to local grid resilience. NEMA supports policies and programs that encourage the deployment and integration of DERs as a cornerstone of modern grid management, advocating for regulatory frameworks that enable market participation, fair compensation, and streamlined interconnection for distributed resources.

To enable broader participation of DERs, DOE can lead efforts to modernize regulatory frameworks at both the state and federal levels. By developing and implementing model policies that combine technical standards with streamlined interconnection procedures, DOE can help remove barriers currently limiting DER integration. Additionally, DOE can provide guidance and technical assistance to state regulators and utilities, encourage the adoption of market mechanisms that reward flexibility and grid support, and facilitate collaboration among stakeholders. These actions will

[2] Thomas Navidi, Abbas El Gamal, and Ram Rajagopal, "Coordinating Distributed Energy Resources for Reliability can Significantly Reduce Future Distribution Grid Upgrades and Peak Load," *Elsevier BV* 7, no. 8 (2023): 1769, http://dx.doi.org/10.1016/j.joule.2023.06.015

empower consumers and communities to actively contribute to grid resilience and energy markets, accelerating the transition to a more flexible and reliable grid.

In response to DOE's RFI, NEMA recommends DOE take the following actions to accelerate demand-side flexibility and DER aggregation:

- Expand funding opportunities and competitive grants for pilot programs and large-scale deployments of DER management platforms, advanced metering infrastructure, and demand response technologies.
- Develop and disseminate model regulatory frameworks and technical standards that facilitate streamlined interconnection, fair compensation, and market participation for aggregated DERs.
- Provide technical assistance to utilities, states, and local governments to design and implement programs that integrate DERs into grid operations, including support for data analytics, cybersecurity, and interoperability.
- Convene stakeholder workshops and collaborative initiatives to share best practices, foster innovation, and address barriers to scaling demand-side flexibility.
- Support AI-enabled forecasting and coordination to manage flexible industrial and data-center loads as grid-responsive assets, including standardized data-sharing with ISOs/RTOs and utilities to improve responsiveness during system stress.
- Continue to support onsite energy, microgrid, and grid-integrated building initiatives through established efforts such as the Onsite Energy Program and the Grid-Interactive Efficient Buildings (GEBS) Initiative.
- Expand technical assistance for states developing DER interconnection modernization, smart inverter settings, and virtual power plant (VPP) readiness through the Grid Deployment Office (GDO).

B. Modular and Other Core Resilience and Reliability Assets

Modular resilience and reliability assets are essential components for grid modernization and ensuring uninterrupted power for critical facilities and large energy users. These assets include battery energy storage systems (BESS), microgrids, mobile generation units, uninterruptible power systems, and rapidly deployable backup systems. Their modular nature allows for flexible installation and scaling, making them ideal for responding to evolving grid needs and supporting new manufacturing, industrial, and data center loads.

BESS plays a pivotal role in grid stability and reliability. With operators planning to add 19.6 GW of utility-scale battery storage to the grid, the U.S. is poised to set a record in storage capacity growth.[3] By storing excess energy during periods of low demand and discharging during peak times, BESS helps balance supply and demand, provide frequency regulation, and support grid resiliency during outages or disturbances. These systems can be deployed at utility scale or integrated into microgrids, offering both centralized and localized benefits. The rapid deployment of BESS enables utilities and large energy users to respond quickly to capacity constraints. In funding programs like the Grid Resilience and Innovation Partnerships (GRIP) Program, DOE can provide critical support

[3] U.S. Energy Information Administration, Preliminary Monthly Electric Generator Inventory, (EIA, 2025).

for BESS, including residential and commercial battery deployments that provide feeder-level relief and peak-shaving. The Loan Programs Office (LPO) could also explore financing structures for aggregated behind-the-meter storage fleets, enabling utilities and aggregators to deploy grid-edge assets at scale.

Microgrids further enhance resilience by enabling critical infrastructure and commercial facilities, such as manufacturing plants, industrial parks, hospitals, military bases, and data centers, to operate independently from the main grid during disruptions. Microgrids combine on-site generation, energy storage, and advanced control systems to maintain operations even when the broader grid is compromised. Their ability to "island" from the grid ensures that essential services remain powered, supporting business continuity, public safety, and national security. Additionally, modular backup generation units and mobile power solutions can be rapidly deployed to address temporary or emergency needs, providing a layer of redundancy for mission-critical operations.

NEMA supports policies and incentives that facilitate the deployment of modular resilience and reliability assets. Streamlined permitting, interconnection processes, and targeted funding can accelerate the adoption of these technologies, ensuring that the grid is prepared to meet both immediate and long-term challenges.

Also critical to ensuring the reliability and resilience of the grid is the deployment of core control and protection assets such as transformers, circuit breakers, reclosers, and switchgear. These assets have a critical role in hardening the grid to ensure it is more resistant to the increasing threats posed by severe weather as well as other physical and cybersecurity risks and thus ensuring uninterrupted power for critical facilities and large energy users. Consequently, they will be foundational to success in expanding grid capacity and enabling demand growth working in tandem with modular resilience and reliability assets.

NEMA recommends DOE take the following actions to advance both modular and core resilience and reliability assets:

- Provide targeted funding for the deployment of BESS, microgrids, and mobile backup generation at critical infrastructure sites and industrial facilities.
- Provide further funding for other core overhead and underground resilience assets to ensure the underlying reliability and resilience of the U.S. grid.
- Streamline permitting and interconnection processes for these technologies by developing model guidelines and collaborating with state and local regulators.
- Offer technical assistance and demonstration grants to utilities and private sector partners to accelerate the integration of modular and other core resilience and reliability assets into grid operations, including support for system design, cybersecurity, and interoperability.
- Facilitate public-private partnerships and convene stakeholder forums to share best practices, address barriers, and promote innovative business models for resilient power solutions.
- Prioritize standardized, template-based deployments across federal facilities and critical infrastructure (e.g., schools, hospitals, and military bases), leveraging bulk procurement

and repeatable designs to compress timelines and showcase replicable models for utilities and private developers.

C. Digital Transformation and Grid-Enhancing Technologies (GETs)

Digital transformation is revolutionizing the way utilities and grid operators manage, monitor, and optimize the electric grid. Grid-enhancing technologies (GETs) encompass a broad suite of hardware and software solutions designed to maximize the efficiency, reliability, and capacity of existing grid infrastructure. By leveraging digital tools and advanced analytics, utilities can unlock latent capacity, improve operational visibility, prevent faults, and respond more effectively to the dynamic demands of modern energy systems.

Key GETs include dynamic line rating (DLR) sensors, advanced conductors, power flow controllers, modular flexible AC transmission system (FACTS) devices, digital substations, predictive analytics, and advanced distribution management systems (ADMS). These technologies enable utilities to maximize the throughput of existing transmission and distribution lines, optimize voltage and reactive power, and improve system visibility. Digital twin platforms and real-time analytics further empower operators to proactively manage constraints, forecast demand, and optimize asset utilization. The adoption of GETs accelerates interconnection timelines for new manufacturing, industrial, and data center loads by optimizing existing infrastructure and streamlining grid planning processes.

Reconductoring is a proven, cost-effective method to accelerate grid modernization. By replacing existing transmission line conductors with higher-capacity advanced conductors, such as those with composite-core designs, reconductoring can more than double line capacity, reduce congestion, and free lost generation capacity, all while leveraging existing rights-of-way to avoid lengthy permitting and siting delays. The vast majority of U.S. transmission lines are less than 50 miles long, which are ideal for reconductoring. These projects' timelines can average 18 to 36 months,[4] years faster than new transmission builds, and can cost a fraction of new construction, quickly delivering the benefits of reliability and affordability. Despite these advantages, adoption remains slow due to institutional and workforce unfamiliarity, outdated cost-allocation frameworks, interregional hurdles, and utility incentives that favor large greenfield projects over efficient upgrades. DOE can play a pivotal role by prioritizing reconductoring in funding programs, updating planning guidance, and supporting workforce training.

NEMA supports continued investment in digital transformation, regulatory support for GETs deployment, and collaborative efforts to share best practices and lessons learned across the industry. NEMA recommends DOE take the following actions to accelerate digital transformation and GETs:

- Expand the GETs portfolio to explicitly include reconductoring and digital-twin/AI-based grid-visibility tools that unlock latent capacity, improve thermal ratings, and shorten

[4] Energy Innovation Policy & Technology LLC, "Reconductoring could help solve America's looming grid crisis," Forbes (Apr. 9, 2024), https://www.forbes.com/sites/energyinnovation/2024/04/09/reconductoring-could-help-solve-americas-looming-grid-problems/.

interconnection timelines through better contingency analysis and congestion management.
- Establish dedicated funding streams and incentive programs for utilities and grid operators to adopt solutions such as dynamic line rating sensors, advanced conductors, power flow controllers, digital substations, and advanced distribution management systems.
- Establish dedicated funding for international standards engagement to ensure American leadership in shaping the global rules that govern emerging technologies, protect national interests, and open markets for U.S. innovation.
- Develop and promote technical standards and interoperability guidelines to ensure seamless integration of GETs across diverse grid environments.
- Provide technical assistance and demonstration grants to support pilot projects that showcase the operational and economic benefits of digital grid technologies, helping utilities build internal expertise and confidence in these innovations.
- Facilitate collaborative research initiatives and convene industry workshops to share best practices, address regulatory barriers, and foster the development of scalable business models for digital grid modernization.

D. Permitting & Interconnection Reform (Process Acceleration)

The rapid deployment of new grid infrastructure and advanced technologies is often constrained by lengthy permitting processes and complex interconnection requirements. Utilities, developers, and manufacturers face significant delays due to inconsistent application procedures, duplicative reviews, and limited transparency in interconnection queues. These bottlenecks not only slow the delivery of urgently needed capacity but also increase project costs and uncertainty for investors and communities. Addressing these challenges is essential for ensuring energy affordability, meeting rising electricity demand and supporting the growth of manufacturing, industrial, and data center sectors.

NEMA recommends that DOE lead interagency efforts to standardize interconnection application templates and study requirements across jurisdictions. By harmonizing procedures and documentation, DOE can reduce variance and rework, enabling faster and more predictable project timelines. Improved queue data transparency and secure data-sharing among utilities, ISOs/RTOs, and regulatory agencies will empower stakeholders to forecast demand, sequence projects efficiently, and identify opportunities for collaborative solutions. These measures will help utilities and developers navigate the interconnection process with greater confidence and efficiency.

Expanding categorical exclusions for commercially proven technologies and transmission projects along brownfield rights-of-way is another critical step. DOE should work with federal and state agencies to identify technologies and project types that can safely bypass duplicative environmental reviews without compromising integrity or public trust. Streamlining these reviews for BESS, microgrids, and other modular assets will accelerate deployment while maintaining rigorous standards for safety and environmental stewardship.

Finally, NEMA urges DOE to support the adoption of AI-assisted tools for permitting and interconnection studies. Advanced analytics and machine learning can automate document processing, optimize study workflows, and enhance auditability and cybersecurity. By piloting these

technologies and establishing standardized, secure data frameworks, DOE can help utilities and agencies process applications and studies more rapidly, reducing cycle times for large-load and generation interconnections while improving consistency and transparency across the sector.

To translate technology availability into delivered megawatts, DOE should lead interagency efforts focused on process speed:

- Standardize interconnection application templates and study requirements across jurisdictions to reduce variance and rework.
- Improve queue data transparency and secure data-sharing among utilities, ISOs/RTOs, and agencies to enable better forecasting and sequencing for large loads.
- Expand categorical exclusions for commercially proven technologies and transmission projects along brownfield rights-of-way where appropriate, maintaining environmental integrity while avoiding duplicative reviews.
- Support AI-assisted tools that help utilities and agencies process studies and documents faster, with auditability and cybersecurity controls.

E. Applying AI to Energy Management, Manufacturing, and the Grid

AI is rapidly transforming energy management across the grid and within customer facilities, offering unprecedented opportunities for efficiency, flexibility, and reliability. AI-enabled energy management systems leverage advanced algorithms, machine learning, and real-time data analytics to optimize energy consumption and DERs, automate demand response, and enhance predictive maintenance and fault prevention for grid assets and facility equipment.

Within manufacturing plants, industrial complexes, and data centers, AI platforms can continuously monitor and analyze energy usage patterns, environmental conditions, and operational schedules. These systems dynamically adjust heating, cooling, lighting, and process loads to minimize peak demand, reduce overall energy consumption, and improve power quality. By integrating with building management systems and industrial automation platforms, AI can orchestrate complex energy strategies, such as shifting flexible loads to off-peak hours, coordinating battery storage dispatch, and optimizing the use of on-site generation resources.

On the grid side, AI-driven analytics empower utilities and grid operators to make faster, more informed decisions. AI systems can process vast amounts of data from sensors, smart meters, weather forecasts, and market signals to predict load growth, identify potential bottlenecks, and proactively manage grid constraints. These capabilities enable more accurate forecasting, improved outage detection and response, and enhanced integration of DERs. AI also supports the automation of interconnection studies, permitting processes, and system planning, reducing project lead times and accelerating the deployment of new capacity. NEMA supports continued investment in AI research, pilot programs, and collaborative initiatives that advance the adoption of intelligent energy management solutions.

AI-enabled digital twin technologies are also a powerful tool to improve power system and facility forecasting and optimize operations. For utilities, digital twins can enhance load forecasting and

integration, while for manufacturing and data centers, they can drive operational efficiencies and provide insights that enable innovation such as grid interactivity and bi-directionality.

NEMA recommends DOE take the following actions to advance the integration of AI into energy management, manufacturing, and grid operations:

- Fund research, development, and demonstration projects that apply machine learning and advanced analytics to grid optimization, predictive maintenance, and demand response.
- Establish collaborative initiatives with utilities, technology providers, and industrial partners to pilot AI-driven platforms for real-time energy management, load forecasting, and process automation.
- Develop technical standards and best practice guidelines for the secure and ethical deployment of AI in critical energy infrastructure, ensuring interoperability and data privacy.
- Provide technical assistance and convene stakeholder workshops to share lessons learned, address regulatory challenges, and promote workforce development in AI and digital skills.
- Pilot AI-enabled document processing and study automation for interconnection and environmental reviews, supported by standardized, secure data-sharing frameworks among utilities, ISOs/RTOs, and agencies. These tools can reduce cycle times for large-load and generation interconnections while improving consistency and transparency.
- Support pilot programs and technical assistance for the deployment of digital twin platforms that enable real-time modeling, monitoring, and optimization of grid assets and DERs.

F. Workforce Readiness (Enabling Delivery at Scale)

The success of grid modernization and rapid infrastructure deployment depends not only on capital investment and technology, but also on the availability of a skilled workforce. For example, the current backlog for various critical infrastructure components, including distribution transformers, is more than two years, caused largely by a lack of skilled and qualified domestic workers. As the industry accelerates the rollout of advanced grid technologies, BESS, reconductoring projects, and digital solutions, the demand for qualified electricians, lineworkers, protection and controls technicians, and data/AI specialists is rising sharply. Workforce shortages will further delay project delivery, increase costs, limit the impact of federal investments, and weaken America's energy dominance.

NEMA recommends that DOE take the following actions to strengthen workforce readiness and ensure timely execution of grid modernization initiatives:

- Support collaboration between DOE, utilities, manufacturers, labor unions, community colleges, and technical schools to develop targeted training programs aligned with the needs of grid modernization projects.
- Ensure that workforce development grants are directly linked to DOE initiatives such as the GRIP Program and the refocused Transmission Facilitation Program (TFP), so that training pipelines are established in advance of project execution.

- Work with industry and educational partners to streamline certification and apprenticeship pathways for electricians, lineworkers, and technicians specializing in grid modernization efforts such as advanced grid technologies, battery storage, and digital systems.
- Provide resources for ongoing professional development and upskilling in areas such as AI, cybersecurity, digital twin platforms, and advanced protection and controls, ensuring the workforce remains prepared for evolving technical demands.
- Convene national and regional forums for utilities, manufacturers, and training providers to share best practices, curriculum innovations, and lessons learned from successful workforce development models.

III. Leveraging DOE Funding, Financing, and Technical Assistance to Accelerate Grid Modernization

NEMA strongly supports DOE's continued leadership in providing targeted funding, financing, and technical assistance to accelerate the deployment of advanced grid technologies and solutions. These efforts are essential to overcoming the barriers of cost, risk, and complexity that often impede the adoption of innovative approaches in grid modernization.

In addition to GRIP and TFP, DOE's Energy Dominance Financing Program further expands access to capital for high-voltage transmission, generation, and integrated systems, supporting the integration of new loads from manufacturing and data centers. By providing loan guarantees and direct loans, DOE can bridge gaps in capital availability, especially for early-stage projects or those facing unique financial hurdles. These programs are particularly valuable for supporting the deployment of BESS, microgrids, and digital grid technologies, which require significant upfront investment but deliver substantial long-term benefits. In addition, DOE should coordinate with the Department of the Treasury to ensure supportive tax guidance and work with both Treasury and the Department of Commerce on supply chain incentives to reduce cost and speed deployment.

DOE's technical assistance programs are vital for enabling states, utilities, and project developers to effectively plan, model, and implement grid modernization initiatives. Access to advanced modeling, analytical capabilities, and planning support from DOE National Laboratories helps stakeholders address complex challenges such as power flow modeling, capacity expansion planning, load forecasting, and technology operational assessments. Technical assistance can also facilitate the integration of DERs, digital twin technologies, and AI-powered management systems, ensuring that new solutions are deployed efficiently and effectively.

By leveraging these funding, financing, and technical assistance programs, DOE can directly support the technical solutions outlined in this letter. For example, targeted grants and loans can accelerate the deployment of core reliability and resilience assets as well as modular battery storage and microgrid assets, while technical assistance can help utilities optimize the aggregation and coordination of DERs. Funding for digital transformation projects can enable the rapid adoption of grid-enhancing technologies, such as dynamic line rating and advanced distribution management systems, unlocking latent capacity and improving system visibility. Additionally, DOE's support for AI research and implementation will be crucial for integrating smart load management and accelerating permitting and interconnection processes.

NEMA encourages DOE to continue expanding and refining these programs, prioritizing projects and initiatives that deliver immediate and long-term benefits to the grid. By aligning financial incentives, technical expertise, and policy support, DOE can help ensure that America's grid is prepared to meet the challenges of rising electricity demand, technological innovation, and economic growth.

IV. Conclusion

NEMA and its members stand ready to collaborate with DOE, Congress, and other stakeholders to translate these principles into policy and action. We welcome the opportunity to provide further information, participate in DOE workshops, and support pilot projects that advance grid modernization and speed to power for America's critical sectors.

Thank you for your leadership and commitment to grid modernization.

Sincerely,

Matt Haynie
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National Electrical Manufacturers Association