Edison Electric Institute
701 Pennsylvania Ave., N.W.
Washington, DC 20004

August 31, 2020

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy and Office of Electricity
Attn: Guidance for Energy Storage Grand Challenge

Re: Response to Request for Information Regarding Energy Storage Grand Challenge

In response to the Notice of Request for Information ("RFI")[1] issued by the Department of Energy ("DOE") and published in the Federal Register on July 16, 2019, the Edison Electric Institute ("EEI") respectfully submits the following comments. EEI is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for more than 220 million Americans and operate in all 50 states and the District of Columbia. The electric power industry supports more than 7 million jobs in communities across the country and contributes $865 billion annually to U.S. gross domestic product, about 5 percent of the total. EEI appreciates the opportunity to respond to this RFI to provide a broad-based understanding of its members current and future needs on energy storage as the industry undergoes the clean energy transformation. EEI looks forward to a continued dialogue and collaboration with DOE on this important issue.

Ensuring that energy storage plays a key role in the electric grid in the future is of paramount interest to electric companies and the customers they serve. EEI's perspective on the questions raised in the RFI are grounded in our member companies' decades of experience operating and using energy storage systems as well as their commitments to continue leading the transition to a cleaner, more resilient energy future. Electric companies are critical partners in implementing energy storage technologies, representing approximately 60 percent of total investment in battery

[1] *Request for Information: Energy Storage Grand Challenge*, 85 Fed. Reg. 43,223 (July 16, 2020) ("RFI"); *Request for Information Extension: Energy Storage Grand Challenge*, 85 Fed. Reg. 46,079 (July 31, 2020) (extending the public comment period to August 31, 2020).

storage technology; owning, procuring, or utilizing 97 percent of grid-connected energy storage today.[2]

A. EEI Members are Leading the Way on Energy Storage and the Clean Energy Transformation.

EEI's member companies invest more than $110 billion annually to make the energy grid stronger, smarter, cleaner, more dynamic, and more secure; to diversify the nation's energy generation mix; and to integrate new technologies that benefit customers. EEI members are united in their commitment to get as clean as they can, as fast as they can, while keeping reliability and affordability front and center for the customers and communities they serve.

EEI's member companies are in the middle of a profound, long-term transformation in how electricity is generated, transmitted, and used. This transformation is being driven by a wide range of factors, including declining costs for natural gas and renewable energy resources, technological improvements, changing customer expectations, federal and state regulations and policies, and the increasing use of distributed energy resources ("DERs"). As a result, the mix of resources used to generate electricity in the United States has changed dramatically over the last decade and is increasingly clean.

Starting in 2016, natural gas surpassed coal as the main source of electricity generation in the United States, and in 2019 natural gas-based generation powered 38 percent of the country's electricity, compared to coal-based generation at 23 percent.[3] Over the past 8 years, more than half of the industry's investments in new electricity generation have been in non-synchronous wind and solar generation resources,[4] and nearly 40 percent of America's electricity is generated from carbon-free resources, including nuclear energy, hydropower, solar, and wind.[5]

Notably, electric companies provide 67 percent of the solar energy in the U.S. This trend of increasing renewable energy deployment will continue: the U.S. Energy Information Administration ("EIA") projects that the United States will add 117 gigawatts (GW) of new wind and solar capacity between 2020 and 2023 and that demand for new electric generating capacity will be met, long-term, by renewables and efficient natural gas as older coal-based and less-

---

[2] *See* EEI, *Energy Storage Trends & Key Issues* (June 2020), https://www.eei.org/issuesandpolicy/Energy%20Storage/2020_June_Storage_Key_Trends_Solutions_FINAL.pdf

[3] *See* EIA, *Electric Power Monthly* (Mar. 2020). According to EIA, in April 2019, U.S. monthly electricity generation from renewable sources exceeded coal-based generation for the first time. Renewable sources provided 23 percent of total electricity generation in comparison to coal's 20 percent. *See* EIA, *U.S. Electricity Generation from Renewables Surpassed Coal in April* (June 26, 2019), https://www.eia.gov/todayinenergy/detail.php?id=39992. According to EIA, this outcome reflects both seasonal factors as well as long-term increases in renewable generation and decreases in coal generation.

[4] *See* EIA, *Nearly Half of Utility-Scale Capacity Installed in 2017 Came from Renewables* (Jan. 10, 2018), https://www.eia.gov/todayinenergy/detail.php?id=34472. *See also* EEI, Industry Data, Statistical Highlights: Capacity and Generation (2018), http://www.eei.org/resourcesandmedia/industrydataanalysis/industrydata/Pages/default.aspx.

[5] *See* EIA, *Electricity Explained: Electricity in the United States* (Apr. 2018), https://www.eia.gov/energyexplained/index.php?page=electricity_in_the_united_states.

efficient natural gas-based generating units retire.[6] By 2021, the EIA forecasts electricity from renewables such as wind and solar will surpass nuclear and coal generation. By 2050, EIA forecasts renewable penetration to reach 38 percent.[7] To support the increased penetration of non-synchronous renewable resources such as wind and solar, EIA forecasts 17 GW of energy storage capacity will be added to the U.S. electric grid by 2050.[8]

These changes have had a profound impact on the sector's carbon dioxide ("CO_2") emissions. Overall, at the end of 2019, emissions from the electric power sector were 33 percent below 2005 levels, their lowest level since 1987. And, collectively, EEI's member companies have reduced their emissions by approximately 45 percent over that same period. These reductions will continue. More than 40 EEI members have announced forward-looking carbon reduction goals, half of which include a net-zero goal by 2050 or earlier. As a result, EEI members are on a path to reduce carbon emissions at least 80 percent by 2050 compared with peak levels in 2005.

Only recently have battery technology costs decreased enough to become, in some instances, a cost-effective energy grid asset and a viable customer solution for regulated electric companies. Energy storage is a versatile resource that can provide multiple benefits to both customers and the energy grid. As electric companies integrate additional non-synchronous resources into the decade, and energy storage costs are forecasted to continue to decline, the role of energy storage as an essential tool for the electric grid will grow.

As documented in the attached compilation of 62 EEI members' energy storage projects demonstrating various use cases, electric companies are already using energy storage in a variety of innovative ways that benefit both the grid and their customers.[9] Although not comprehensive, the case studies included in this booklet illustrate the breadth and dynamism of EEI member companies' projects in driving the energy storage market throughout the United States. The case studies illustrate that electric companies have vetted various storage technologies, some at pilot project level, and are using lessons learned to increase scale and locate storage technologies to optimize benefits while managing cost impacts to its customers. Several technology ownership and operation business models and partnerships addressed in the document have evolved since publication.

Electric companies are critical partners for advancing a robust, sustainable energy storage industry and accelerating the deployment of energy storage, given their unique ability to maximize the value of energy storage for the benefit of all customers. As discussed in greater detail below, electric companies' unique perspective on energy storage yielded recommendations

---

[6] *See* EIA, *Annual Energy Outlook 2020: With Projections to 2050* (Jan. 29, 2020) at 71-73, https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Full%20Report.pdf. While EIA notes in the Annual Energy Outlook ("EIA AEO") that the amount of renewable and natural gas-based generation deployed are dependent on the price of natural gas, this does not impact the expected closure of coal-based and other less efficient generation. *See id*. at 88.

[7] *See* EIA, *EIA expects U.S. electricity generation from renewables to soon surpass nuclear and coal*. (Jan. 30, 2020) https://www.eia.gov/todayinenergy/detail.php?id=42655#:~:text=In%20the%20latest%20long%2Dterm,surpass%20natural%20gas%20in%202045.

[8] *See* EIA AEO at 82.

[9] *See* Appendix A: EEI, *Leading the Way: U.S. Electric Company Investment and Innovation in Energy Storage* (2018), https://www.eei.org/issuesandpolicy/Energy%20Storage/Energy_Storage_Case_Studies.pdf.

and considerations for DOE as it seeks to grow America's leadership in energy storage utilization and exports through the Energy Storage Grand Challenge.

B. Recommendations and Considerations for DOE Regarding the Energy Storage Grand Challenge.

1. EEI Members Recommend Funding Large-Scale Fire Testing of Operational Battery Energy Storage Systems.

As DOE encourages the U.S. energy storage industry, building and maintaining confidence in the safety of energy storage systems will continue to be essential. DOE asks several questions related to safety measures of storage technologies, specifically lithium-ion.[10]

EEI members recognize the importance of battery energy storage systems ("BESS") safety and have participated in the development of industry standards, including the National Fire Protection Association's Standard for the Installation of Stationary Energy Storage Systems (NFPA 855). EEI and its members recognize, however, that NFPA 855 should not cover ESS installations under the exclusive control of an electric company where such installations are installed in accordance with the IEEE National Electrical Safety Code ("NESC"), ANSI C2. Other energy storage system safety standards include the International Fire Code ("IFC"), UL 1973, UL 9540, and the UL 9540A test method. Local governments with jurisdiction over the installed energy storage systems may have additional permitting requirements, such as the National Electrical Code ("NEC").

With over 90 percent of the commercial experience in grid-connected battery installations, electric companies have significant experience in developing, implementing, and refining the BESS safety practices, as well as integrating energy storage into the grid.[11] Lessons learned from BESS integration and close work with the manufacturers has led to sound BESS commissioning and operations practices.

Drawing upon experience of recent large-scale BESS-related incidents, BESS codes and standards are being revised. Current BESS safety codes and standards acknowledge cascading thermal runaway as a risk, yet do not require suppliers to prohibit cascading thermal runaway. The BESS codes and standards also do not address the risks of heat transfer to neighboring cells and modules, which can lead to outgassing of flammable (thus potentially explosive) and toxic byproducts. The standards in place today focus on the means to manage a fire but avoid prescribing solutions that restrict or stop cell-to-cell and module-to-module thermal runaway propagation.

Even though commercially available technologies and design methodologies that can address thermal runaway propagation are available, they may not all be available from a single BESS supplier or integrator. Additionally, they also must be proven to perform as designed via large-scale fire testing. However, large-scale fire testing can be a costly and time-consuming process, especially for smaller companies working to commercialize new safety features and technologies. EEI recommends that the DOE support these safety improvement efforts by

---

[10] *See* 85 Fed. Reg. at 43,228.

[11] *See* EEI, *Energy Storage Trends & Key Issues* (June 2020), https://www.eei.org/issuesandpolicy/Energy%20Storage/2020_June_Storage_Key_Trends_Solutions_FINAL.pdf

funding testing for technologies, products, or processes that are intended to stop cell-to-cell propagation, which is the end goal of BESS safety design.

While technology development is a long-term process, the electric companies' more immediate need is the large-scale fire testing of currently available BESS products. This testing is very expensive and can run into the millions of dollars, making energy storage technology providers reluctant to submit their products to this destructive testing.

Currently, energy storage safety system technology is developed in isolation, each independent system doing a specific job as designed and developed. However, BESS safety needs to be more fully integrated and testing should occur as a single operational system to ensure the required functionality is delivered. Funding for this full-scale testing would facilitate critical progress as the industry continues to build confidence and improve safety protocols.

EEI recommends that the DOE help fund the large-scale fire testing of BESS safety systems as they operate in the field. Alternatively, or in addition, a DOE testing facility where BESS suppliers can test their products can help accelerate industry best practices for testing and BESS safety design. In all cases, EEI recommends ensuring the results of the testing are available to the industry and the public because there is a critical gap in available data from these tests. Codes and standards bodies would be able to utilize the testing results to update standards and refine best practices.

2. Electric Companies Should be Able to Own, Operate, and Procure Energy Storage and Can Best Optimize Energy Storage.

DOE requests information on regulatory barriers to the implementation of energy storage and state policies that could be enacted to help the U.S. become a leader in energy storage.[12] For the reasons discussed below, electric companies should be permitted to own, operate, and procure energy storage.

For electric companies, using energy storage adds flexibility, reliability, and resiliency in supporting generation, transmission, and distribution operations. Energy storage is not a single technology but rather a host of different technologies with vastly different operating characteristics, cost structures, and benefits. The type of energy storage technology that is deployed in each location largely is determined by that area's resources, needs, and market structure. Energy storage, deployed at the appropriate locations and scale, can be used in various ways to enhance electric company operations, optimize and support the energy grid, and enhance the customer experience.

The specific benefits attributable to various energy storage technologies depend upon the services a storage technology is capable of providing. It is used for a wide range of applications, such as the integration of more renewable and non-synchronous energy resources, all resulting in more efficient and economical operation of the energy grid and. Electric companies' experience gained from increased volume of DERs connections and behind-the-meter storage has also contributed to a greater understanding of the benefits and challenges of energy storage.

Realizing the full benefits of energy storage will depend on the resource's ability to provide multiple services and to be compensated fairly for services provided. The value of energy

[12] *See* 85 Fed. Reg. at 43,230-43,231.

storage is determined based on the specifications and uses of the individual project, which can make it difficult to compare costs across energy storage projects. Some storage technologies, for example, are more appropriate for integrating renewables, while others are more appropriate as peaking plant replacements or for providing ancillary and essential reliability services.

Although energy storage devices can provide multiple energy grid services and participate in different markets, they often cannot capture all value streams due to existing market performance requirements and code of conduct restrictions. The ability of energy storage to become cost-competitive and meet these performance requirements would help it monetize all value streams and realize its full economic potential.

To be able to optimize and support the energy grid, ensure its reliability, and enhance the customer experience, electric companies should be able to own, procure, and operate energy storage. Some states have passed legislation to explicitly allow electric companies and others to own energy storage.[13] Yet in certain states of the country with restructured electricity markets, electric companies may not be allowed to own energy storage because it is classified either as generation or as a competitive service. Access restrictions derived from existing asset classification rules (when, for example, storage is classified as a generation asset) mean that electric companies in some parts of the country may not be allowed to invest in energy storage devices.

Electric companies' inability to own energy storage in some cases takes away an option to enhance the reliability and resiliency of the nation's energy grid to the benefit of all customers. For example, electric companies—with their extensive knowledge of the electric system—are in the best position to identify the most valuable applications and the optimal locations to site resources on the energy grid. The location matters when it comes to the deployment and operation of distribution and transmission system assets, including energy storage.

Siting storage appropriately is important because the same resource can help or hurt the reliability and resiliency of the energy grid depending upon where it is located and how it is operated. Electric companies are also able to optimize the operations of these assets while ensuring that the solutions deployed are cost effective, as new technologies have the potential to

---

[13] For example, in 2016, Massachusetts changed its restructured market rules to allow electric companies to own energy storage as a means to improve the reliability of the energy grid. *See* Mass. Gen. Laws Chapter 188, Section 1, An Act to Promote Energy Diversity (2016), https://malegislature.gov/Laws/SessionLaws/Acts/2016/Chapter188. Similarly, under New York's Reforming the Energy Vision, electric company ownership of storage is allowed for reliability reasons. *See* New York Public Service Commission, Order Adopting Regulatory Policy Framework and Implementation Plan, p. 69, Docket 14-M-0101 (Feb. 2015), http://documents.dps.ny.gov/public/MatterManagement/MatterFilingItem.aspx?FilingSeq=137167&MatterSeq=44991 ("For those resources that are on the utility's system and will be used to support and enhance reliable system operations, utility ownership and operation is reasonable."). In 2018, Virginia passed a law that includes storage in the definition of public utility activity, enabling the state's electric companies to own and operate storage for the benefit of their customers, recognizing energy storage as a technology for supporting grid reliability. *See* Va. Code Ann. § 56-576 (2020), https://law.lis.virginia.gov/vacode/title56/chapter23/section56-576/. Also, the Illinois Commerce Commission granted Commonwealth Edison the ability to own, operate, and recover costs of the Bronzeville microgrid, with the goal of testing resilience during outages. *See* Illinois Commerce Commission, Final Order, Docket 17-0331, (Feb. 2018), https://www.icc.illinois.gov/docket/P2017-0331/documents/276063.

defer or to reduce the need for incremental investments or, on the contrary, require additional investments in new capacity or distribution or transmission upgrades.

As energy markets and business models continue to evolve, it is important that clear rules govern ownership, procurement, and operation of energy storage assets to maximize the benefits that storage provides, without interfering with electric companies' responsibility to maintain safe and reliable operation of the energy grid. This can only effectively be done by allowing electric companies to fully utilize and own energy storage resources, even in restructured states.

3. Existing Asset Classification Rules at State and Federal Levels May Not Account For All Attributes of Energy Storage Technologies.

DOE asks about how energy storage assets should be classified.[14] Storage is a technology that may not always fit cleanly into the traditional generation, transmission, and distribution asset classes. Existing regulations were developed at a time when pumped hydro was essentially the only form of energy storage. As a result, existing regulations do not account for the particular characteristics and intrinsic flexibility of some newer storage technologies and may not always allow for the provision of multiple services. Regulations and standards should recognize the flexibility of the various types of energy storage and the best ways each can be used and should allow the use of energy storage technologies on a comparable basis with other resources, regardless of whether they support generation, transmission, distribution, on either demand- or supply-side operations.

The RFI asks questions about storage asset classification and valuation.[15] The issues driving that conversation (including revenue streams, market rules, and cost recovery) continue to be considered by state and federal regulators, policymakers, and industry stakeholders. For example, although the Federal Regulatory Commission's ("FERC") Order No. 784 provided valuable guidance on the accounting and reporting of transactions associated with the use of energy storage devices in public utility operations, additional questions have arisen upon implementation, necessitating further dialogue between the regulated community and FERC. This ongoing discourse exploring important questions that implicate cost recovery and, accordingly, valuation, is part of the productive engagement between the regulated community and FERC and is well placed in that context.

4. Electric Companies Must Have the Ability to Determine Where on the Grid and When Energy Storage Can be Safely, and Reliably Integrated and Regulations Should be Clarified to Allow for Energy Storage.

DOE asks about interconnection for stationary storage.[16] Electric companies are responsible for transmission and distribution system reliability and must account for the impacts to their systems when new resources, including energy storage, are added. Electric companies are responsible for interconnecting and operating new energy storage devices safely and reliably. Therefore, electric companies must have the ability to determine where on the grid and when these resources can be safely and reliably integrated. It is critical that any deployment of energy storage is part of long-term, system-wide resource planning processes and balance system impacts and operational

[14] *See* 85 Fed. Reg. at 43,231.

[15] *See id.* at 43,230-43,231.

[16] *See id.* at 43,229.

safety that optimizes benefits while reducing costs.[17] Storage interconnection may be a challenge in some areas, and infrastructure and regulations may need to be upgraded to accommodate two-way flows of electricity so storage can charge and discharge energy on the grid.

In studies analyzing the impact of these new interconnections, energy storage devices generally are assumed to charge and discharge at levels and times that are inconsistent with actual operations. Integration of DERs, such as battery storage, into electric transmission and distribution operations is complex and requires the adoption of additional distribution automation technologies. Whether transmission-level, distribution-level, or direct customer interconnection is implemented, system impacts should be assessed using criteria appropriate to the technology, the intended uses of the device, and the electric system in which the device is to be utilized.

Like all resources that interconnect to the energy grid, energy storage devices should be required to define the parameters under which they will operate. For instance, it should be clear what service(s) the energy storage system will provide, where it will operate (i.e., transmission or distribution system), when it will be available and for how long (duration), and how these systems will accomplish those tasks while coordinating with electric systems operations.

In addition, regulations should be clarified or revised to accommodate energy storage attributes. For example, historically, regulations addressed consumption at generating plants with net deliveries to the energy grid. These types of regulations are being applied to storage devices but are ill-suited to accommodate energy storage systems that receive electricity to store for later discharge to the energy grid.

5. DOE Should Support Long-Duration, Seasonal Storage, Domestic Critical Minerals Production.

DOE asks about concerns about investing in the storage technology space.[18] Lithium-ion energy storage, the most widely used energy storage battery chemistry today, becomes increasingly expensive as the duration of energy storage increases to more than 4 hours. Long-duration (from 10-12 hours up to seasonal) storage will be key for meeting clean energy and net zero targets while sustaining operational reliability and resilience. Currently, there are very few commercial options for energy storage of these durations. However, several promising technologies exist, including kinetic energy, liquified air, flow batteries, zinc hybrid, and hydrogen, and other low carbon energy carriers.

These technologies, which are pre-commercial today, constitute an important focus for the development of next generation energy storage technologies. This will require a focus on grid-scale pilots and demonstrations that build the experience and confidence for widespread deployment, a departure from historic energy storage research, development, and deployment, which has focused on small-scale pilot projects. For electric companies to continue to pilot nascent energy storage technologies, DOE needs to provide support for technology providers and help electric companies lessen the risks associated with dealing with research and development

---

[17] EEI, *Electric Companies Help Maximize the Benefits of Energy Storage* (2019), https://www.eei.org/issuesandpolicy/Energy%20Storage/EEI%20Energy%20Storage%20Ownership_042019_Final.pdf.

[18] *See* 85 Fed. Reg. at 43,230.

stage companies and technologies, particularly in situations when technology providers declare bankruptcy.

In addition, electric companies will need a secure supply chain that protects both the customers and the grid. Increasing domestic critical minerals production is essential. EEI member companies are investing in significant amounts of battery storage and will benefit from domestic critical minerals production that will help industry scale to much larger production facilities and provide cost-competitive materials. Supporting domestic critical minerals production will help diversify the supply chain, stimulate competition, and ultimately lower commodity prices for essential materials to expand the development of battery storage.

DOE should consider supporting the domestic production of critical minerals—such as lithium—by encouraging stable markets for domestic critical minerals production. DOE also should increase funding for research, development, and deployment of critical material extraction and processing facilities to lower project risk and bring more production sites online. This approach will drive future private investment and expansion in domestic critical mineral production and increase the diversity of the supply chain. Cost-effective recycling systems are also needed to reduce mineral demand and to lower lifecycle waste.

6. DOE Should Defer to FERC on Wholesale Market Participation Questions.

The RFI asks a number of questions related to market access for energy storage resources and the services that they can provide. Specifically, the RFI seeks information on the types of services that can be provided (e.g., ancillary services, demand response) and how services can be provided (e.g., individually or on an aggregated basis).[19] Due to their operational and physical characteristics, energy storage resources can be used to provide a variety of services to the energy market. These include providing ancillary services needed to support the transmission and distribution systems, as well as energy products and, capacity products. Energy storage resources can also provide a variety of different grid services at different times, which help lower delivered energy costs and enhance reliability, resilience, and improves power quality.

As energy storage resources increasingly seek to participate in the wholesale market, FERC has initiated a number of proceedings to ensure that market rules are able to accommodate the physical and operational characteristics of energy storage participation in the markets and to reduce barriers to entry. EEI has supported the participation of energy storage resources in the wholesale markets on a comparable basis with other resources. This includes advocating that market rules should be clarified or modified so that all resources capable of providing a product be permitted to participate in that market. This will help ensure that product requirements and eligibility are tied to the underlying operational needs of the system and not the characteristics of specific types of generation.[20]

In addition, resources that are located behind-the-meter on the distribution system may also seek to participate in the FERC regulated wholesale markets. EEI members have an interest in ensuring that any actions taken to allow these resources, including aggregated resources, to participate in the wholesale markets, do not negatively affect electric distribution companies' ability to maintain the reliability of the distribution system. Electric distribution companies,

[19] *See id*. at 43,228-43,229.

[20] *See id.* at 43,231.

along with state regulators, are responsible for maintaining a reliably operating distribution system, which includes providing all customers with reliable and economic electric service at a just and reasonable rate, meeting reliability requirements, modernizing and replacing infrastructure as needed, accommodating new technologies, meeting public policy requirements, and enhancing grid security.

Maintaining these responsibilities at current levels becomes more challenging as more dynamic resources interconnect with the distribution system and as more of these interconnected resources seek to participate in the wholesale electric markets. An essential component of maintaining the reliability and safety of the distribution system is having all the information necessary to do so. Accordingly, electric distribution utilities need to have additional visibility and operational control of the resources that are integrated to the distribution system for planning and daily operation purposes.[21] In addition, electric companies should have priority use over resources that are connected to its distribution system as these resources have often been critical in maintaining system reliability.

To date, FERC has initiated a number of proceedings to address specific issues related to the participation of energy storage resources in wholesale markets. These include, but are not limited to:

- Issuing Order No. 784, which made changes to the Uniform System of Accounts to better account for and report transactions associated with the use of energy storage devices in public utility operations.[22]
- Issuing a Policy Statement on the Utilization of Electric Storage Resources for Multiple Services When Receiving Cost-Based Rate Recovery, which clarified that providing services at both cost- and market-based rates is permissible as a matter of policy.[23]
- Issuing Order No. 841 which required regional transmission operators ("RTOs") and independent system operators ("ISOs") to modify their tariffs to accommodate the physical and operational characteristics of energy storage resources.[24]
- Issuing a proposal and convening a technical conference to discuss the effects of allowing aggregated DERs to participate on the bulk power system and on distribution systems.[25]

---

[21] *See id*.

[22] *Third-Party Provision of Ancillary Services; Accounting and Financial Reporting for New Electric Storage Technologies*, Order No. 784, 144 FERC ¶ 61,056 (2013).

[23] *Utilization of Electric Storage Resources for Multiple Services When Receiving Cost-Based Rate Recovery,* Policy Statement, 158 FERC ¶ 61,051 (2017).

[24] *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 841, 162 FERC ¶ 61,127 (2018); Errata (2018) ("Order No. 841"), Order No, 841-A, 167 FERC ¶ 61,154 (2019), *order upheld sub. nom. American Pub. Power Ass'n, et al. v. Federal Energy Regulatory Comm'n*, D.C. Cir. No. 19-1147 (2020).

[25] *Participation of Distributed Energy Resource Aggregation in Markets Operated by Regional Transmission Organizations and Independent System Operators* and *Distributed Energy Resources Technical Considerations for*

- Convening a technical conference to discuss the technical and market issues prompted by the growing interest in hybrid resources or projects that are comprised of energy storage resources paired together with a generation resource at the same plant location.[26]

Thus, FERC has been proactive in working with stakeholders including RTOs/ISOs to ensure that energy storage resources are able to participate in the markets as both transmission and generation resources. EEI generally has been supportive of these efforts and has noted that practical and operational issues will need to be considered and addressed. These include ensuring that resources needed for reliability are available when needed.

As with all complex market issues, there are implementation, operational, interconnection, cost-allocation and jurisdictional issues that will continually need addressing by RTOs, ISOs, state regulators, and electric utilities. For example, RTOs/ISOs have submitted compliance filings to implement Order No. 841 and some RTOs/ISOs are beginning to evaluate how storage can reliably participate as a transmission asset. In order to ensure system reliability, electric storage resources should not receive preferential treatment. Through its initiatives, FERC is working to ensure that electric storage resources are able to participate in the existing markets and provide ancillary and other services.

Given FERC's regulatory authority over markets and existing, complex regulatory structures for ensuring the effective functioning of these markets, DOE should defer to FERC on these matters.

7. DOE Should Employ a Flexible Approach in Considering Resilience and With Respect to Energy Storage Policy Issues.

Ensuring the resilience of the electric grid is of paramount importance to electric companies and the customers they serve, and EEI works to encourage policies that promote investments in resilience. EEI's perspective on the questions raised in the RFI are grounded in our member companies' decades of experience preparing for and responding to electric system threats associated with severe weather and man-made hazards, including cyber events that may impact electric reliability. Additionally, EEI members are active participants in a growing set of initiatives that seek to make the critical infrastructure they operate more resilient.

Approaches to resilience should be flexible, recognize important variations across regions and electric systems, and account for the local conditions electric companies face. For example, risks from extreme weather, including hurricanes and wildfires, vary by region. In addition, the local conditions electric companies operate within vary greatly, including with respect to climate, customer density, proximity to a coast, transportation modes, electric markets, state regulations, the configuration of their delivery systems (i.e., the proportion of radial vs. non-radial lines, the

the Bulk Power System, Notice of Technical Conference, Docket Nos. RM18-9-000 and AD18-10-000 (Feb. 15, 2018).

[26] *Hybrid Resources*, Notice of Technical Conference, Docket No. AD20-9-000 (Apr. 7, 2020).

length and capacity of lines, etc.). EEI continues to engage at the FERC and with state regulators[27] to promote policies that support EEI members' necessary investments in resilience.

8. Electric Companies Should be Involved Directly in Vehicle-to-Grid Battery Storage.

Across the U.S., electric companies are building the infrastructure needed to support transportation electrification, with the support of automakers, charging station manufacturers, and others in the business community. At the same time, there is a global movement to adopt electric transportation targets, as countries move to address environmental goals by limiting or removing tailpipe emissions. Transportation electrification provides an opportunity to leverage declining power sector emissions to also achieve reductions in transportation sector emissions. The increased deployment of electric vehicles ("EVs") in all vehicle classes will increase overall fuel economy and reduce dependence on imported petroleum, as well as reduce greenhouse gas ("GHG") and criteria pollutants emissions from the transportation sector. As power sector emissions have been reduced—and are on a long-term trajectory toward further reductions, as discussed above—the resulting reductions in GHG and criteria pollutant emissions from electricity generation will allow increased EV deployment to create additional environmental benefits both today and in future years. This is because the increased deployment of electric vehicles will use more of the increasingly clean power generated by the electric sector.[28]

The RFI asks several questions on the premise that EVs represent a large and untapped potential as "bi-directional storage" that should be utilized as a grid asset that can be called upon and dispatched by a grid operator.[29] The RFI focuses its inquiries on the economics and underlying conditions needed to transition EVs, at both the individual and fleet level, to bi-directional storage assets.[30]

It is important for electric companies to be involved directly in vehicle-to-grid battery storage at the early stage in order to understand how this technology impacts the grid and where to most optimally locate charging systems and injection points for maximum grid benefits. Electric companies must continue working with regulators to design rates that benefit the grid and its customers, as well as maintain public and electric system safety.[31]

[27] Two notable examples of this collaborative work are EEI's active participation with NARUC's recently created Presidential Task Force on Emergency Preparedness, Recovery and Resiliency (see https://www.naruc.org/about-naruc/press-releases/naruc-creates-emergency-preparedness-recovery-and-resiliency-task-force/), as well as engaging Commissioners, Consumer Advocates and Electric Industry Representatives on the issue of resilience, which culminated in the following report: "Planning for the Electric System of the Future: The Path to a More Resilient Energy Grid", produced by the Critical Consumer Issues Forum, available at: http://www.cciforum.com/wp-content/uploads/2020/07/CCIF-Resilience-Report-July-2020-Final.pdf.

[28] *See* Electric Power Research Institute ("EPRI")-Natural Resources Defense Council, *Environmental Assessment of a Full Electric Transportation Portfolio*, https://www.epri.com/research/products/3002006881. Incentives for early adoption of EVs will immediately begin showing environmental benefits.

[29] *See* 85 Fed. Reg. at 43,228-43,229.

[30] *See id*.

[31] As DOE is aware, EVs represent a potentially significant amount of new load for electric companies to handle, possibly presenting issues surrounding demand response concerns, integration of numerous EVs in a specific location, and others. DOE should continue its important work on integrating EVs as load by continuing to coordinate

It is important to note that—while the EV market has significantly evolved in recent years and there are over 1.5 million EVs on the road today—EVs provide numerous grid benefits beyond potential use as bi-directional charging assets. The contribution from an individual EV is small, but aggregated EV injection could be a viable resource, for example, during emergency events. Indeed, while there might be some future benefit to using EVs as grid assets, additional research, development, and deployment is needed.[32] As it stands, electric companies are well-positioned to make targeted and strategic investments in EV charging infrastructure that benefit the broader community and accelerate EV adoption.

The current lack of EV charging infrastructure is one of the primary barriers to widespread EV adoption. EEI and the Institute for Electric Innovation ("IEI") released a report in 2018 forecasting 18.7 million electric vehicles on the road by 2030.[33] To support that many EVs by 2030, 9.6 million charging ports will be needed.[34] This penetration is unlikely to be successfully achieved without significant electric company investment.

Automakers are also making substantial commitments to EVs. Ford Motor Company and General Motors Company have more than 2 dozen new battery EVs in the pipeline;[35] and automakers and suppliers are expected to invest $225 billion in EV development and technology through 2023.[36] As more EV models become available, it is imperative that sufficient charging infrastructure be available for customers.

To date, 48 electric companies in 26 states and the District of Columbia have invested more than $1.51 billion in EV programs.[37] While this is an impressive number, more is needed. The type of EV program can vary by state and electric company, but usually includes at least one of the

---

and learn from partners in the electric sector, charging equipment manufacturers, and state regulators to surmount any challenges that might be presented by this transition. DOE should continue to fulsomely address these issues and not move past them to focus exclusively on vehicle-to-grid (V2G) resources. However, V2G issues are also likely to be significant as the EV market develops and more EVs are adopted by drivers. DOE should adopt the same approach to work with industry and state partners to address any issues—such as possible interconnection issues, market impacts, or distribution impacts on the electric grid—as V2G strategies continue to develop from pilots and to implementation phases in future years.

[32] For example, Con Edison and Dominion Energy have implemented pilot programs to test the vehicle-to-grid capabilities of electric school buses. *See* Con Edison, *Electricity from School Bus Batteries Will Support Con Edison Grid Reliability* (June 19, 2018) https://www.coned.com/en/about-us/media-center/news/20180619/electricity-from-school-bus-batteries-will-support-con-edison-grid-reliability; Dominion Energy, *Electric School Buses* (June 18, 2020) https://www.dominionenergy.com/ourpromise/innovation/electric-school-buses.

[33] EEI and IEI, *Plug-in Electric Vehicle Sales Forecast Through 2025 and the Charging Infrastructure Required Through 2030* (Nov. 2018), https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_EEI-EV-Forecast-Report_Nov2018.ashx.

[34] *See id*.

[35] Reuters, *Factbox: Ford and General Motors' electric vehicle plans,* (Mar. 26, 2020), https://www.reuters.com/article/us-autos-emissions-suvs-lineup-factbox-idUSKBN21D1LT.

[36] ABC News, *Has cheap fuel pulled the plug on electric vehicles?* (Mar. 17, 2020), https://abcnews.go.com/Business/cheap-fuel-pulled-plug-electric-vehicles/story?id=70619683.

[37] EEI, *Electric Transportation State Biannual Regulatory Update: June 2020*, https://www.eei.org/issuesandpolicy/electrictransportation/Documents/FINAL_ET%20Biannual%20State%20Regulatory%20Update_June%202020.pdf.

following elements: (1) investments in, or ownership of, charging infrastructure; (2) rebates and incentives to customers for charging infrastructure deployment; (3) customer education and outreach; and (4) EV-specific rates. Together, these programs can unlock value for all customers by growing the EV market for all participants, by helping to integrate EV charging into the energy grid in a cost-effective manner, and by driving outcomes that protect customer interests and maximize customer value.

California's rules regarding the ownership of electric vehicle charging supply equipment ("EVSE") provides another relevant example of the important role that electric companies can have in accelerating technology adoption, creating new markets, and achieving state public policy goals. In 2014, recognizing the unique benefits that electric company investment in EVSE could provide to accelerate market adoption in support of the state's EV and carbon reduction goals, the California Public Utility Commission ("CPUC") lifted a previously instituted prohibition on electric company ownership of EVSE.[38] These service benefits included the ability to install EVSE cost effectively and quickly, to serve disadvantaged communities, and integrate EVSE into the energy grid. As a result, the California investor-owned electric companies have been approved to invest $818 million in "make-ready infrastructure" and rebates for EVSE for medium- and heavy-duty vehicles, plus level-2 and DC fast charging at California public parks and public schools. These investments could provide crucial support for achieving the state's on-road EV and carbon reduction goals.

As EV adoption grows, both the energy grid and the electric company's role as an integrator of energy resources becomes more important. Significant EV adoption without a coordinated or managed charging program could lead to capacity constraints on the distribution grid. Managed charging refers to any strategy that provides a signal to influence how drivers charge their EVs, including time-varying rates, demand response programs, and other types of smart charging.[39] EVs that are charged either at home (e.g., single family or multi-family dwellings) or at work provide the greatest opportunity to manage charging in the near term. Managed charging can enhance the EV customer experience by saving drivers money, lowering their carbon footprint, and simplifying their charging process, while minimizing cost impacts on the grid. Electric companies can also use managed charging programs to more directly engage and interact with customers.

Enhancing the customer experience and achieving energy grid benefits for the benefit of all customers are the two main goals of a successful managed charging strategy. There are many options for managing charging and, at present, there is no one option for achieving these outcomes on a larger scale.[40] Electric companies need the flexibility to implement a range of solutions to understand how managed charging strategies will scale as EVs become a more significant share of the transportation system.

---

[38] California Public Utilities Commission, Phase 1 Decision Establishing Policy to Expand the Utilities' Role in Development of Electric Vehicle Infrastructure, Decision 14-12-079 (Dec. 2014), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M143/K682/143682372.PDF.

[39] Vehicle-to-grid is not considered, as this opportunity is limited for these use cases in the near term.

[40] EPRI provides a technical explanation of the different communication and control pathways to enable smart charging. *See* EPRI, *Smart Charging 101: The Basics of Managed Electric Vehicle Charging.*

EVs also benefit all customers by improving energy grid utilization. Programs that encourage charging to occur when the energy grid has available capacity will minimize costs and help the grid operate more efficiently, effectively lowering the average system cost, which provides direct benefits to all electric customers. A June 2019 report by Synapse Energy analyzed the energy grid costs and revenues associated with EVs in the service territories of Pacific Gas & Electric and Southern California Edison, which have the most EVs in their service territory of any other electric company. From 2012 through 2018, revenues from EVs were $584 million greater than costs.[41] One reason is because EV customers on time-of-use rates tend to charge during off-peak hours, which helps utilize the energy grid's resources more efficiently and keeps costs down for everyone.[42] This is not a California-only dynamic: A study by E3 for AEP Ohio's service territory similarly found that EV adoption resulted in net customer benefits, as the revenue collected from EVs charging on the energy grid exceeds the cost to serve them.[43]

Additionally, a study by the Illinois Citizens Utility Board ("CUB") calculated hourly and flat-rate charging costs and compared the total charging costs for various vehicles and charging scenarios. EV drivers on a time-based rate, such as Ameren's Power Smart Pricing, would save up to 51 percent on their energy costs when compared to customers on flat rates.[44] Accordingly, CUB concluded that time-base rates are effective at incentivizing EV drivers to charge when there will be minimal strain on the energy grid. As mentioned above, EVs provide benefits to drivers and non-drivers by putting downward pressure on electricity rates, but it is also important to emphasize that electric companies' direct participation in the EV market is vital to ensure that these benefits are realized by all customers, regardless of the socio-economic situation or whether they own an EV.

Commercial fleets and transit agencies are also making the transition to zero-emission vehicles due to technological advances, GHG reduction commitments, and favorable economics. A 2018 UPS/GreenBiz Study found that large companies and government agencies are electrifying their fleets in order to achieve sustainability goals and lower their total cost of vehicle ownership.[45] The New York City Department of Citywide Administrative Services saved significantly on maintenance costs with their battery EV fleets when compared to traditional gasoline vehicles.[46] Businesses, governments, and transit agencies recognize that fleet electrification makes them more competitive, helps to reduce operational expenses, and is a way to achieve sustainability goals.

---

[41] Synapse Energy, "*Electric Vehicles Are Driving Electric Rates Down: June 2019 Update*," https://www.synapse-energy.com/sites/default/files/EV-Impacts-June-2019-18-122.pdf.

[42] *Id*.

[43] Energy and Environmental Economics, "*Cost-Benefit Analysis of Plug-in Electric Vehicle Adoption in the AEP Ohio Service Territory*," (April 2017). https://www.ethree.com/wp-content/uploads/2017/10/E3-AEP-EV-Final-Report-4_28.pdf.

[44] CUB, *Charge for Less: An Analysis of Electricity Pricing for Electric Vehicles in Ameren Territory* (Feb. 2020), https://www.citizensutilityboard.org/wp-content/uploads/2020/02/ChargeForLess_Ameren_Final.pdf.

[45] UPS/GreenBiz, *Curve Ahead: The Future of Commercial Fleet Electrification* (2018), https://sustainability.ups.com/media/UPS_GreenBiz_Whitepaper_v2.pdf.

[46] New York City Department of Citywide Administrative Services, *NYC Fleet Newsletter: Issue 255* (Mar. 8, 2019), https://www1.nyc.gov/assets/dcas/downloads/pdf/fleet/NYC-Fleet-Newsletter-255-March-8-2019-Reducing-Maintenance-Costs-With-Electric-Vehicles.pdf.

The EV market has significantly evolved in recent years; however, it is essential that DOE recognize that EVs provide numerous grid benefits beyond any potential use as bi-directional charging assets. Indeed, while there might be some future utility to using EVs as grid assets, in some use cases, that possibility should not take attention away from the need to increase the deployment of EVs and charging infrastructure today and in the near future to take advantage of the environmental and grid benefits that increased EV deployment provides.

9. DOE Should Consider Emerging Energy Storage Supply Chain Issues Specific to Security.

i. Technology, Cybersecurity, and Safety Considerations are Part of the Conversation on Energy Storage.

Recognizing DOE's concern about the security of the energy storage supply chain,[47] EEI would like to provide several additional issues for consideration regarding technology, cybersecurity and safety as they may relate to increased use of BESS and its interaction with the grid. Electric companies are constantly evolving to keep pace with new technologies and new threats to the grid. For example, companies must keep pace with the proliferation of "smart" devices, which effectively have expanded the attack surface of the digital networks we rely on every day. As deployment of interconnected smart devices increases throughout the electric delivery system, the energy grid must be secured in new ways to prevent cybersecurity incidents from disrupting the flow of power or impacting reliability.[48]

BESS are "smart" and thus designed to provide a variety of operational information, including charging/discharging status, battery health, temperature and other diagnostic information. BESS may also include other complex intelligence to determine when to charge or discharge based on dynamic pricing models, local distribution grid conditions, or commands provided by local or remote operators. Although this intelligence and functionality provide the basis for operations, they also expand the attack surface. An attack surface is the collection of all the points or places where an adversary or unauthorized user can either obtain sensitive information or disrupt the expected operation of the device.

Electric companies continually work to protect the evolving distribution system against interruption, exploitation, compromise, or outright attack. However, companies cannot focus solely on preventing incidents. That is why the electric power industry employs "defense-in-depth" and resilience strategies that help prepare companies to restore power quickly and to continue operating in the face of all hazards.

Securing an increasingly interconnected system in a rapidly changing threat environment presents real challenges for our nation's electric companies. The industry is keeping pace, but effective policies also must be developed to address these potential safety and security risks for customers, energy grid operators, and the nation.

ii. New Technologies and Increased Connectivity Create New Risks.

While large-scale generation and transmission systems form the backbone of the energy grid, the number of distribution assets, distributed generation, and "behind the meter" customer devices is

---

[47] *See* 85 Fed. Reg. 43,226-43,227.

[48] *See Securing the United States Bulk-Power System*, 85 Fed. Reg. 26,595 (May 4, 2020).

growing and will change the broader electricity ecosystem over time. In addition, the deployment of both utility scale and customer-sited energy storage solutions provides benefits but also poses potential risks.

The growth of network-connected devices, systems, and services comprising the industrial Internet of Things ("IoT") in the distribution system creates significant opportunities and benefits for society. However, the security standards of IoT devices—many of which are "consumer grade"—have not necessarily kept up with the rapid pace of innovation and deployment. Meanwhile, as with the devices themselves, the threats from cyber actors continue to evolve rapidly.

With the expansion of DERs, including BESS and inverter-based resources, there is a need to ensure essential reliability services such as inertia, frequency response, reactive power, and voltage support are provided to the grid. BESS can be used to provide elements of grid support, including providing flexible ramping support, fast frequency response, and an alternate to peaking capacity.

iii. Distribution System Owners are Responsible for Energy Grid Operability and Reliability, Even as Other Parties Add New Distribution System Components that May Create New Layers of Associated Risk.

Electric companies and their regulators take their responsibility to defend electricity delivery systems seriously. Increasing collaboration among electric companies, technology companies, and regulators is critical during the design and deployment of the energy grid to ensure visibility for grid owners and operators into these systems once they are deployed. As more parties become involved in installing and operating DER, the question becomes who bears the cost of the infrastructure that will need to be installed at the distribution level to facilitate the DERs' participation in the aggregation, as well as the on-going system maintenance costs associated with equipment cycling due to the increase in bi-directional flows.

Assessing cybersecurity risk is especially important for new manufacturers, vendors, and service providers as they design and implement their devices, systems, and services. Security needs should be included in the design process, and initial deployments of new technologies also should be done in close coordination with incumbent system operators.

Further, distribution system owners rely on the visibility of key data and specific information to operate their systems. System operators need to ensure this data remains available when needed, has high integrity (i.e., is not altered in an unauthorized manner), and is kept confidential to ensure potential adversaries cannot exploit the information for future attacks.

As distribution owners, vendors, service providers, researchers, regulators, and policymakers seek to learn more about the distribution system's security posture, it is important to balance the needs for transparency, protection of sensitive information, and the ability to share security information in a timely manner to help distribution system owners protect and operate their systems effectively. This balance also must be maintained in a way that ensures the integrity of the information that operators and customers rely upon.

iv. There are Material Differences Between the Nation's Bulk Electric System and More Localized Distribution Networks, and Security Strategies and Policymaking Should Reflect These Differences.

The nation's generation and transmission systems make up the backbone of our energy grid. The existing system of rigorous regulatory standards enforced by the FERC is appropriate to ensure a baseline level of security for our most critical assets. However, distribution systems supply electricity to critical customers and, because of interconnectivity, increasingly have an impact on the broader energy grid.

Thus, a collaborative, risk-based approach to security at the distribution level is essential. As with all other aspects of distribution system planning, system owners should balance the benefits and available resources with the risk to make informed decisions on security measures that recognize regional differences and a range of diverse threats. For example, implementing identical security measures within all distribution systems may not be feasible and could be prohibitively expensive for electric companies and their customers. A risk-based approach will help electric companies assess which security measures need to be implemented in the near term and those which can be implemented over time to manage risk appropriately.

v. While the Industry is Focused on Stopping Cyberattacks Before They Happen, Being Prepared to Respond and to Recover is a Key Part of Any Security Strategy.

Cybersecurity risk exists in many forms, and the potential consequences of a cybersecurity incident may vary widely. Because not all risks can be mitigated, distribution system owners must prepare to respond to and to recover from cybersecurity incidents.

The industry also is pursuing—and is uniquely capable of implementing—a system of supplemental operating strategies to ensure that system operators can maintain the flow of electricity even while operating in a degraded state. These strategies include the development of contingency plans and the ability to revert to manual operation in certain areas.

The industry's culture of mutual assistance also has expanded to include a cyber mutual assistance program that would bring industry experts together to support restoration following a cyber incident impacting operations. Participation continues to grow, and more than 80 percent of all customers in the United States are served by electric companies that are members of the program.

vi. Protection of Critical Infrastructure is a Responsibility Shared by Industry Operators, Government Policymakers, Technology Providers, and the National Security Community.

Information sharing among distribution owners, operators, vendors, service providers, and government agencies regarding threat and vulnerability identification and monitoring, incidents, responses, and recovery efforts is needed to prevent cybersecurity incidents from spreading.

This is crucial for managing cybersecurity risks that may be present in hardware, software, or third-party services. Addressing supply chain security is a challenge facing the nation and all critical infrastructure providers. This is a priority that is integral to the protection of cyber systems deployed throughout the energy grid.

There is no question that smart technologies are creating new risks, but the electric power industry has been, and remains, committed to developing the security, mitigation, and response strategies needed to ensure energy grid security and resiliency. No one electric company or set of standards can do this all alone, which is why the industry also is committed to maintaining and to growing partnerships across the industry and with the government to protect our nation's critical infrastructure and to deliver the security and reliability our customers expect.

10. DOE Should Consider Principles for Managing Supply Chain Cybersecurity Risk

Maintaining the integrity of the electric grid's information and communications technology ("ICT")—the critical software, firmware, and hardware that enables the information technology, the operational networks, and the industrial control systems used by electric utilities—is a major concern to the industry. A supply chain compromise of ICT could result in the use of products that do not function as intended or that have malicious functionality, thereby impacting electric reliability and safety. DOE should take into account these considerations for managing supply chain cybersecurity risk to the extent they impact BESS supply chain issues.

i. Utilities and Their Vendors Must Collaborate to Manage Supply Chain Cybersecurity Risk to Ensure a Safe and Reliable Electric System.

The nation's electric grid is interconnected and highly complex. In turn, the supply chain of the electric grid's owners and operators also is highly complex, consisting of thousands of individual vendors and suppliers. A single utility often relies on a number of primary vendors that may use multiple—and potentially international—third-party suppliers for components used in their products or technologies.

While much of the initial responsibility for managing supply chain cybersecurity risk falls on the vendors, including their manufacturers, suppliers, and distributors, utilities and their service providers also have key responsibilities before, during, and after a product is purchased. Vendors and utilities must work together to define these responsibilities, assign accountability, and set expectations that may vary by the product, system, vendor, and user. Government partners—in support of utilities and vendors—also have a critical role to play by sharing information on product vulnerabilities or facilitating the development of new supply chain cybersecurity risk management testing processes and technologies.

ii. Utilities and Their Vendors Should Use Multi-Disciplinary Approaches and Cross- Functional Cooperation to Manage Supply Chain Cybersecurity Risk.

Supply chain cybersecurity risk management decisions are made throughout the product and system lifecycle, including design, development, procurement, implementation, maintenance, and deployment. To make these decisions, utilities and vendors need to involve operations, security, risk management, procurement, and legal professionals to clearly communicate and mitigate the risk.

Vendor and utility personnel involved in the design, testing, implementation, maintenance, and decommissioning of products and systems should be adequately trained in the functional and security features of the technology and the systems they develop and manage. Also, vendors and utilities should include cross-functional expertise in their procurement and sub-contracting processes.

iii. It Is Essential That Vendors Use Secure Manufacturing and Development Practices and That Utilities Establish Policies to Review These Practices Before Integrating ICT Into Their Systems.

Managing supply chain cybersecurity risk includes the use of secure manufacturing and development practices. Vendors must use highly controlled manufacturing and development processes and secure software coding practices. To ensure the integrity of the products and systems being developed, vendors should consider not only their own security practices but also those of their third-party suppliers, including service providers. Utilities also should establish policies for review and validation of the processes used by their vendors and service providers before executing contracts and integrating ICT into their systems.

iv. Vendors Must Build Cybersecurity Features Into the Design of New Products, and Utilities Must Build Defense-In-Depth Security Into Their Systems.

Vendors must design cybersecurity features into their products, which can be tailored to utility environments and secured by utilities and their service providers. Key cybersecurity considerations include secure communications; logging capabilities; secure (e.g., validated, signed, and updated) software and firmware; and the ability to remove or disable unnecessary software, firmware, services, ports, access, hidden accounts, and generic default accounts with publicized passwords.

Utilities also must build defense-in-depth security into their systems. This requires controls for personnel security, system access (physical and electronic), authorization, authentication, and patch management, as well as methods to secure data and prevent and/or detect malware.

v. Utilities and Vendors Must Monitor and Update Deployed Products and Legacy Systems Continually Throughout All Phases of the Product Lifecycle.

Threats and vulnerabilities directly affect supply chain cybersecurity risk. As new vulnerabilities are discovered within ICT components or as the threat landscape changes, the risk associated with the supply chain also changes. As the risk environment evolves, it is increasingly important that utilities have confidence in the operations and security of the systems using ICT. The operational functionality and cybersecurity features of these systems also must be verified throughout all phases of the product lifecycle to ensure they are behaving as expected. Vendors and utilities also must prepare and account for safe disposal at product end of life.

C. Summary of Recommendations and Considerations for DOE.

Electric companies are leading the way on the clean energy transformation and are critical partners for advancing a robust, sustainable energy storage industry given their unique ability to maximize the value of energy storage for the benefit of all customers. With investments in new technologies such as energy storage, combined with the right policies in place, electric companies can do even more to build a cleaner, stronger economy in the near term. Electric companies will continue to play an essential role in delivering reliable, resilient and affordable energy future for the customers and communities we serve, and electric companies' use and operation of energy storage will play a critical role.

As described in more detail above, EEI offers the following principles and recommendations to DOE as it considers long-term planning of energy storage programs under the Energy Storage Grand Challenge:

i) Fund BESS fire safety testing as follows:
   a. Large-scale fire testing of operational BESS;

  b. Testing for technologies, products, or processes that are intended to stop cell-to-cell propagation, which is the end goal of BESS safety design;
  c. A DOE testing facility where BESS suppliers can test their products to help accelerate industry best practices for testing and BESS safety design;

ii) Recognize that energy storage can provide multiple value streams;

iii) Give electric companies the ability to own, operate, and procure energy storage, enabling its optimization;

iv) Allow electric companies to determine where on the grid and when energy storage can be safely, and reliably integrated; clarify regulations to allow for energy storage;

v) Support long-duration, seasonal storage research, development, and deployment by focusing on grid-scale pilots and demonstrations and supporting long-duration technology providers that will in turn help electric companies lessen the risks associated with dealing with research and development stage companies and technologies;

vi) Support domestic critical minerals production, product end-of-life considerations; consider increasing funding for research, development, and deployment of critical material extraction and processing facilities;

vii) Defer to FERC on wholesale market participation matters;

viii) Employ a flexible approach in considering resilience and with respect to energy storage policy issues;

ix) Acknowledge that electric companies' direct involvement in vehicle-to-grid battery storage is critical;

x) Consider emerging energy storage supply chain issues specific to security, including:
  a. The need to balance transparency, protection of sensitive information, and the ability to share security information in a timely manner to help distribution system owners protect their systems; and
  b. The commitment of the electric power industry to developing the security, mitigation, and response strategies needed to ensure energy grid security and resiliency together with industry and government partners.

For the foregoing reasons, EEI urges the DOE to consider these comments and ensure that the Energy Storage Grand Challenge Roadmap and DOE's further programs focusing on energy storage are consistent with the views expressed herein.

Respectfully submitted,

____

Richard McMahon
Senior Vice President, Energy Supply & Finance

Megan E. Vetula
Associate General Counsel, Energy Regulation

Olga Chistyakova
Senior Manager, Clean Energy

Edison Electric Institute
701 Pennsylvania Ave., N.W.
Washington, DC 20004

Appendix A

Leading the Way: U.S. Electric Company Investment and Innovation in Energy Storage

Please follow the link to view the 62 case studies. Due to the Word.doc submission requirements, we were not able to combine the case studies into this response to DOE's Energy Storage Grand Challenge Request for Information.

https://www.eei.org/issuesandpolicy/Energy%20Storage/Energy_Storage_Case_Studies.pdf