ADVANCED ENERGY ECONOMY
Transforming Policy. Expanding Markets.

"Building a 100 Percent Clean Economy: Solutions for the U.S. Power Sector"

Testimony Before The

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Committee on Energy and Commerce

Energy Subcommittee

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Chairman Rush, Ranking Member Upton, and Members of the Subcommittee, it is an honor to testify today on the opportunity to utilize clean advanced energy technologies to decarbonize the power sector and the U.S. economy.

My name is Jeff Dennis, and I am General Counsel and Managing Director at Advanced Energy Economy (AEE). AEE is a national organization of businesses making the energy we use secure, clean, and, affordable. AEE represents more than 100 companies and organizations that span the advanced energy industry and its value chains. Technologies that we consider advanced energy include energy efficiency, demand response, solar, wind, storage, electric vehicles, advanced metering infrastructure, transmission and distribution efficiency, fuel cells, hydro power, nuclear power, combined heat and power, and enabling software. Used together, these technologies and services will create and maintain a higher performing energy system—one that is reliable and resilient, diverse and cost effective —while also improving the availability and quality of customer facing services. AEE also manages the Advanced Energy Buyers Group (AEBG), which represents the interests of large electricity consumers interested in increasing their purchases of advanced energy to meet clean energy and sustainability goals.

Rapid deployment of low- and zero-carbon advanced energy technologies is essential to the goal of decarbonizing the power and transportation sectors identified by the Committee. AEE strongly supports this Committee's efforts to undertake a broad review of the available policy opportunities for deep decarbonization to reach net-zero greenhouse gas emissions by 2050, including but not limited to a price on carbon, a clean energy standard, market reforms to incentivize more clean energy investment and greater customer access to those resources, various financial incentives, and federal support for research, development, and demonstration of zero-carbon technologies. We welcome the opportunity to work with the Committee as it explores some or all of these policy options to achieve the goal of net-zero emissions by 2050.

Today, I will discuss three major trends in the advanced energy industry that impact efforts to decarbonize the power sector:

1. Technological innovation has brought us to the point that advanced energy technologies, right now, are the least-cost option for energy supplies, producing consumer savings, improving grid reliability and resilience, and driving economic development and job creation;
2. States and consumers, particularly large corporate buyers, are making efforts to capture the economic, reliability, and environmental benefits of advanced energy;
3. Federal leadership in wholesale electricity markets provides both a near- and long-term opportunity to lower consumer costs, expand consumer access to advanced energy, and reduce emissions.

Advanced Energy Technologies are Producing Consumer Savings, Improving Reliability and Resilience, and Driving Economic Development and Job Creation

Advanced energy technologies are now the most cost-effective resources on the electricity grid. These technologies are providing cost savings for electricity consumers and enhanced grid reliability and resilience, all while supporting millions of American jobs and reducing carbon emissions. As a

result, the power sector is poised to play a central role in building a 100% clean economy in the United States.

The rapid decline in advanced energy technology costs creates a major opportunity to reduce carbon emissions in the power sector and achieve significant cost savings for consumers by switching away from traditional higher-emitting power generation technologies. To be clear, energy innovation has created an opportunity to transition to a 100% clean power sector while saving consumers money, not driving up their costs. In particular, the cost of wind and solar energy has dramatically dropped over the past decade. The average levelized cost of energy (LCOE)[1] of large-scale solar energy declined 13% from last year and has fallen 88% since 2009, putting the average cost between $36 to $44 per megawatt hour (MWh), without subsidies. The average LCOE of onshore wind energy declined 7% from last year and is down 69% since 2009, putting the average cost between $29 and $56 per MWh, without subsidies. With the cost of coal-fired energy at $60 to $143 per MWh and natural gas combined cycle energy at $41 to $74 per MWh, renewable energy technologies are now highly competitive resources in the power generation marketplace.[2]

In fact, costs have fallen so sharply that investing in new wind and solar energy projects can be more cost-effective than continuing to pay the operating costs (*i.e.*, fuel and maintenance costs) of some traditional generating resources such as aging coal and nuclear plants. With the production tax credit (PTC) and investment tax credit (ITC), new wind and solar are $14 and $32 per MWh respectively. By comparison, the average marginal cost of power from a fully depreciated coal plant is $36 per MWh. Recent research found that in 2018, 74% of the nation's coal fleet could be replaced right now at a lower

[1] LCOE measures the average cost of electricity over the life of a project, including the costs of capital, operations and maintenance, fuel, and financing. In short, LCOE is the most basic indicator of power technology competitiveness over its useful life.

[2] "Levelized Cost of Energy and Levelized Cost of Storage 2018", Lazard, available at https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2018/

cost with the same amount of electricity from local wind and solar; by 2025, replacing nearly all of the nation's coal fleet would save money.[3] Simply put, retiring the vast majority of the existing coal fleet and investing in wind and solar would lower electric bills across the United States for homes and businesses, all while reducing carbon emissions substantially.

Advanced energy technologies are not only the lowest cost energy options today; they also provide enhanced reliability and greater power system resilience in the face of extreme weather and other threats to the grid and to traditional inputs to power production. Wind, solar, demand response, energy efficiency, energy storage, and distributed energy resources, when used together, provide reliable, dispatchable, and flexible energy and grid services to electricity consumers.[4] These technologies diversify the electricity generation mix and reduce the reliability risks that stem from dependence on deliveries of solid, liquid, and gas fuels for power generation. They also provide reliable and flexible performance during low frequency, high impact events on the grid, such as extreme weather conditions.[5] Earlier this month, over 700 MW of flexible demand response resources were deployed to maintain reliably in the Mid-Atlantic states during an unusual hot weather event that occurred during a period when many traditional generation technologies are typically shut down for maintenance.[6] In

[3] "The Coal Cost Crossover: Economic Viability of Existing Coal Compared to New Local Wind and Solar Resources," Energy Innovation Policy and Technology LLC, https://energyinnovation.org/wp-content/uploads/2019/04/Coal-Cost-Crossover_Energy-Innovation_VCE_FINAL2.pdf.

[4] *See, e.g.*, "Using Renewables to Operate a Low-Carbon Grid: Demonstration of Advanced Reliability Services From a Utility-Scale Solar PV Plant", California ISO, National Renewable Energy Laboratory (NREL), and First Solar, http://www.caiso.com/Documents/UsingRenewablesToOperateLow-CarbonGrid.pdf.

[5] See 2014 Polar Vortex examples in ERCOT and PJM: ERCOT, "Final Report: January 6, 2014 EEA." (7 Mar. 2014) available at http://www.ercot.com/content/meetings/ros/keydocs/2014/0306/ROS_Jan_6_EEA_Report.pdf.; "Polar Vortex Review," NERC (Sept. 2014) available at https://www.nerc.com/pa/rrm/January%202014%20Polar%20Vortex%20Review/Polar_Vortex_Review_29_Sept_2014_Final.pdf ; PJM Interconnection. "Response to Consumer Reports on 2014 Winter Pricing." (19 Sept. 2014) available online at http://www.pjm.com/~/media/documents/reports/20140919-pjm-response-toconsumer-reports-on-2014-winter-pricing.ashx.

[6] *See* PJM Report on October 2 event, available at https://www.pjm.com/-/media/committees-groups/committees/oc/20191015/20191015-item-06-load-management-reduction-action.ashx

addition, distributed energy resources installed by individual customers to address their own unique reliability needs are also ideal for resolving operating reliability issues on discrete sections of the distribution grid, and can be aggregated together to address broader reliability and resilience needs on the bulk electric system.

Advanced energy is also an engine for economic growth in America. Advanced energy is a $238 billion U.S. industry, roughly equal in revenue to aerospace manufacturing and double the biotechnology industry. Advanced energy revenue grew 11% last year, nearly four times the rate of the U.S. economy overall. Since 2011, the compound annual growth rate of advanced energy revenue has been 6%.

This rapid expansion of the advanced energy industry is translating into American jobs. There were 3.5 million American jobs in the advanced energy industry in 2018, up 4% from the year before, more than double the growth rate of U.S. jobs overall, and employers expect to add 6% more jobs this year. Advanced energy employs more U.S. workers than retail stores (3 million), twice as many as hotels and motels (1.7 million), and more than three times as many as the coal and oil industries combined.[7] These employment benefits are spread across all 50 states, in both rural and urban communities, and in communities that previously relied on fossil fuel-based industries. AEE has developed state-specific job analyses in several states that show how critical advanced energy jobs are to the economy:

- In Virginia, advanced energy employs more than 100,000 workers, more than hospitals;
- In Texas, advanced energy employs 233,000 workers, with advanced energy jobs spread across every one of the state's 254 counties;
- In Colorado, 65,000 workers are employed in advanced energy, double the employment in mining and oil and gas production;

[7] *See* AEE National Advanced Energy Jobs Fact Sheet, available at https://info.aee.net/aee-national-advanced-energy-jobs-fact-sheet.

- In Indiana, a historic coal and manufacturing state, advanced energy employs 90,000 workers, more than auto parts manufacturing; and

- In Ohio, there are nearly 120,000 advanced energy workers, more than in machinery manufacturing;

- Other states that AEE has analyzed include Michigan (134,000 advanced energy workers), Illinois (130,000 advanced energy workers), and Florida (174,000 advanced energy workers, three times as many as the agricultural sector).

Supportive state and federal policies can spread these economic development benefits even further.

States and Consumers, Particularly Corporate Buyers, Are Taking Steps to Capture the Economic, Reliability, and Environmental Benefits of Advanced Energy Technologies

State policymakers and regulators, electric utilities, and large electricity consumers are all recognizing the consumer savings and reliability advantages of switching to renewables and other forms of advanced energy, and they are taking action. Today, a combination of proactive state policies, utility planning, and the demands of large corporate consumers of clean energy are the primary drivers of growth in the advanced energy market and the reductions in carbon emissions from the power sector that result.

Today, state policymakers and regulators are taking policy actions to reduce carbon emissions from the power sector. While states are utilizing different policy approaches based on their particular circumstances and preferences, and options that are successful in one state may not be successful in another, some of the approaches states are pursuing today include:

- **Expanded renewable and clean energy standards**: Numerous states are passing more aggressive standards requiring that customers be served by ever increasing amounts of renewable and carbon-free electricity generation. While California and Hawaii have long had big commitments to renewable energy, in just the past year, several states have passed legislation to increase their usage of renewable and carbon-free sources, including Maine (80% by 2030 and 100% by 2050), Maryland (50% by 2030), Nevada (50% by 2030), New Mexico (100% by 2045), New York (70% from renewables by 2030 and 100% carbon free by 2040), and Washington (100% from carbon neutral sources by 2045). Other states like Michigan and Virginia have also increased their support for renewable energy and energy efficiency standards that will bring billions of dollars in investment to these states.

- **Improved utility resource planning:** State regulators and their utilities are also conducting robust generation planning processes (including improved Integrated Resource Plans, or IRPs, in states using this tool) that are better capturing the reduced costs and increased capabilities of advanced energy technologies. In Indiana, Northern Indiana Public Service Company (NIPSCO), after conducting a robust IRP analysis, plans to retire all of its coal fleet and replace it with a mix of wind, solar, energy storage, and demand-side resources; NIPSCO estimates that its customers will save $4 billion from this switch.[8] In Arizona, Arizona Public Service Company (APS) determined that the needs of its customers for power supplies at times of peak demand would be better served by investing in energy storage technologies that can be used in combination with its vast solar resources, rather than investing in a traditional natural gas peaking plant.[9] And PacifiCorp announced that it will propose a massive build-out of wind, solar, and electric storage resources that will allow it to retire two-thirds of its coal-fired power plants across the Pacific Northwest and Mountain West by 2030, and 80% by 2038.[10] While not all states and utilities are alike when it comes to resource planning, these examples demonstrate that when wind, solar, electric storage, and other advanced energy technologies are compared in a fair and transparent process, they win on price and performance.

- **Reforming utility business models and regulatory approaches**: States are increasingly taking steps to reform how utilities do business, and their regulatory oversight of utilities, to better recognize the value of investments in energy efficiency, demand-side management, distributed generation, and other customer-facing options. State regulation has traditionally based a utility's earnings potential on its ability to scale its capital investments in infrastructure such as poles, wires, and transformers. This was important when the country was electrifying, but exclusively rewarding capital investment now creates a barrier for many customer-owned resources, like storage and demand response, which can fully or partly replace the need for new infrastructure. Several states are now looking into methods for making utilities neutral as to how system needs are met, whether by utility investment in transformers and wires or customer investment in solar and storage. Some states are also looking into ways of providing earnings based on utility performance, such as giving them a share of the value in reducing customer demand or meeting emissions reduction goals.

- **Allowing customer choice and competition for retail services:** Competitive retail markets such as Texas that allow residential, commercial, and industrial customers to easily shop for wind and solar energy from competitive electricity providers have led the way in developing renewable resources. Texas is now the number one state in the country in wind generation, with more than 24 gigawatts of wind capacity, almost three times the amount of the next

[8] NIPSCO 2018 Integrated Resource Plan Executive Summary, available at https://www.nipsco.com/docs/librariesprovider11/rates-and-tariffs/irp/irp-executive-summary.pdf?sfvrsn=9

[9] "Historic shift: APS says batteries are cheapest energy option, plans big investment," *Arizona Republic* (Feb. 21, 2019), available at https://www.azcentral.com/story/money/business/energy/2019/02/21/aps-battery-cheapest-energy-option-arizona-power-grid/2911299002/

[10] "Leaving behind coal, PacifiCorp plans decades-long push into renewables, with heavy investment in solar in Washington," *The Seattle Times* (Oct. 4, 2019), available at https://www.seattletimes.com/business/leaving-behind-coal-pacificorp-plans-decades-long-push-into-renewables-with-heavy-investment-in-solar-here/

closest state. Texas also produces more solar power than all but five states, while more than 40,000 MW of new solar capacity is in the queue to connect to the Texas power grid. Moreover, as explained below, customer choice facilitates the ability of large corporate customers to increase their voluntary purchases of zero emissions advanced energy technologies, a key driver for market growth and carbon emissions reductions.

- **Distribution system planning that capitalizes on the potential for distributed energy resources to reduce emissions and improve reliability and resilience:** In order to make the most of energy efficiency investments and customer-owned resources that reduce the need for utility investments in the grid, utilities need to be able to better predict where and when those resources will be adopted so that they adjust their grid investments accordingly. Providing consumers with information regarding distribution system capability to handle new distributed energy resources also allows for more efficient adoption of such technologies. As weather events have increasing impacts on the economy and the physical well-being of the population, utilities need more tools to contain and isolate outages from the rest of the grid or keep critical infrastructure and institutions functioning when the rest of the grid goes down. These goals require the development of new and sophisticated planning tools and operational changes within distribution utilities. States like Michigan, New York, and California are at the forefront of these efforts.

As state policies are accelerating advanced energy investment, large corporate customers are also major drivers of the growth of renewable and advanced energy technologies. 71% of Fortune 100 companies and 43% of Fortune 500 companies have established renewable and/or climate targets as part of their corporate sustainability commitments. Companies are setting these goals for multiple reasons, including obtaining cost savings from renewable energy, meeting the needs and expectations of their employees and the communities where they work, responding to concerns from leadership and boards of directors regarding the risks of climate change, and responding to customer preferences to be aligned with brands that support clean energy and environmental goals.

To fulfill their commitments, these companies are increasing their purchases of advanced energy technologies, including renewable energy like wind, solar, geothermal, and hydropower; demand-side resources like energy efficiency, demand response, and energy storage; and onsite generation from solar, natural gas generators, and fuel cells. Since 2008, commercial and industrial customers have signed contracts to procure 22 gigawatts (GW) of renewable energy, including a record 7.15 GW in 2019 so far. Most recently, large renewable energy purchases to power their operations were announced by both

Google (18 power purchase agreements for a total of 1,600 MW[11]) and Amazon (two power purchase agreements totaling 215 MW of solar in Virginia and North Carolina[12]).

In addition to renewables, these large corporate customers are increasing their investments in energy efficiency, demand response, distributed energy resources, and energy storage, to make their operations more resilient, save them money, and provide benefits to the grid. For example, Microsoft's Virginia data center has behind-the-meter battery storage for backup power and power quality, piloting an advanced uninterruptible power supply system with capability to support both critical load and grid services applications; this project provides around-the-clock reliability at the host site while providing frequency regulation service to the wholesale market. Other data centers, including those run by Equinix, Apple, and eBay, are utilizing fuel cells to provide backup power in the event of grid failure.[13] In another example, over two-dozen Walmart stores in California have installed advanced energy storage systems to shave the retailer's peak load, balance on-site solar generation with store consumption, and help the local utility, Southern California Edison, reduce peak demand on the grid in conjunction with a broader grid modernization plan.[14] Similarly, over 800 Target stores in 31 states

[11] "Google Has Bought Enough Renewable Electricity to Power All of Uruguay," *Fortune* (Sept. 21, 2019), available at https://fortune.com/2019/09/20/google-renewable-energy-uruguay-climate-week/

[12] "Amazon announces 265 MW in new solar, wind as part of 100% renewables pledge," *Utility Dive* (Oct. 25, 2019), available at https://www.utilitydive.com/news/amazon-announces-265-mw-in-new-solar-wind-as-part-of-100-renewables-pledg/565788/

[13] "Equinix Makes Big Bet on Fuel Cell-Powered Data Centers," Data Center Knowledge (Aug. 16, 2017), http://www.datacenterknowledge.com/energy/equinix-makes-big-bet-fuel-cell-powered-data-centers.

[14] "Wal-Mart, Advanced Microgrid Solutions to Turn Big-Box Stores Into Hybrid Electric Buildings," Greentech Media (April 11, 2017), available at https://www.greentechmedia.com/articles/read/wal-mart-to-turn-big-box-stores-into-hybrid-electric-buildings#gs.MEHYBsw.

participate in demand-response programs, reducing peak demand and helping to keep the electric system in balance while also delivering operational savings.[15]

Federal Leadership in Wholesale Electricity Markets Provides a Near-Term Opportunity to Lower Consumer Costs, Expand Consumer Access to Clean Energy, and Reduce Emissions

While AEE supports Congress considering long-term solutions to achieving net-zero emissions by 2050 utilizing advanced energy technologies, Congress and the Federal Energy Regulatory Commission (FERC) also have critical immediate roles in ensuring that wholesale electricity markets are designed to give consumers the economic, reliability, and emissions reduction benefits of greater deployment of low-cost advanced energy technologies.

As I explained earlier, right now, advanced energy technologies are cost-competitive and technically capable of reliably providing key grid services. Technology-neutral wholesale markets that allow all technologies to compete based solely on price and performance will lead to advanced energy technologies winning in the market and displacing the output of aging high-emitting traditional power plants, driving down carbon emissions and lowering the cost of energy for consumers.

The organized wholesale electricity markets operated by Regional Transmission Organizations and Independent System Operators (RTOs/ISOs) and regulated by FERC are critical platforms for fostering competition and innovation. These markets are key to accelerating the adoption of advanced energy technologies and the transition to a zero-carbon electricity grid. Organized competitive wholesale markets have spurred innovation in a wide range of technologies that support a more resilient grid, including battery storage, fuel cells, and a host of renewable energy technologies. They have also given large corporate buyers of renewable energy tools to cost-effectively pursue their objectives; the vast

[15] "How Target uses demand response to cut energy, supply chain costs," Supply Chain Dive (Sept. 21, 2017), https://www.supplychaindive.com/news/Target-demand-response-supply-chain-costs/505359/.

majority of the 22 GW of advanced energy projects developed to satisfy corporate demand have been concentrated in RTO/ISO markets.

Too often, however, the rules and regulations in competitive wholesale markets either implicitly or explicitly preclude advanced energy technologies from fully participating.[16] Existing rules often do not account for the technical and operational characteristics of advanced energy technologies, resulting in barriers to their ability to participate and provide all of the wholesale services they are capable of. These barriers to market entry stem largely from the fact that the rules and regulations governing these markets were established at a time when the electricity system was overwhelmingly dominated by large central-station thermal power plants. Removing these barriers would unleash significant market-based investment in cost-effective advanced energy technologies, lowering rates for consumers and producing significant emissions reductions.

To illustrate the market rule and regulatory barriers that advanced energy faces in these markets, AEE released a paper in May 2019, *Wholesale Market Barriers to Advanced Energy – and How to Remove Them*, detailing 21 case studies that demonstrate how market regulations can hinder participation by advanced energy technologies in wholesale markets, and the steps that can be taken to resolve them.[17] The paper begins by documenting success stories in removing regulatory and market rule barriers. For example, in Order No. 841, FERC required RTOs/ISOs to reform their market rules to allow electric storage resources to fully participate in their wholesale markets; this action alone unlocks the potential for 50 GW of investment in new electric storage resources that will support the integration of more renewable energy and the reliability and resilience of the bulk electric system.[18] Other

[16] For more on wholesale market policy and barriers to participation in wholesale markets, see AEE's Wholesale Electricity Market Policy Brief series at https://info.aee.net/wholesale-markets-policy-briefs

[17] "Wholesale Market Barriers to Advanced Energy – And How to Remove Them", Advanced Energy Economy, available at https://info.aee.net/wholesale-market-barriers-to-advanced-energy

[18] *Electric Storage Participation In Markets Operated By Regional Transmission Organizations and Independent System Operators*, Order No. 841, FERC Docket Nos. RM16-23-001 and AD16-20-00, 183 Fed. Reg. 9580 (Mar. 6, 2019), 162

documented successes include FERC's rejection of a proposed market rule change that would have blocked energy efficiency resources from wholesale market participation in PJM[19] as well as PJM's creation of a new market (called "Regulation D") that enables resources like energy storage and demand response to provide essential grid reliability services.[20]

These success stories provide a roadmap for how to remove many of the remaining barriers to wholesale market participation by advanced energy technologies. As FERC concluded in Order No. 841, these barriers to participation inhibit competition in the wholesale markets, causing unjust and unreasonable rates for consumers. Key examples of existing and emerging market barriers in wholesale markets today include:

- Existing rules preventing distributed energy resources from fully participating in wholesale markets. A FERC rulemaking has been pending for nearly three years that would, if finalized, reform these rules to open the wholesale markets to full participation by distributed energy resources, allowing aggregations of resources like rooftop solar, distributed energy storage, and electric vehicles to provide valuable wholesale services. As AEE noted in a recent whitepaper, the current regulatory uncertainty stifles investment in these technologies and largely limits their usage to retail markets, which hinders wholesale competition and market efficiency while harming customers.[21]

- Current regulations and proposed market rule changes that favor investment in large scale fossil-fuel generation over utilizing more affordable renewable resources and demand-side resources like efficiency and demand response.

- Conflicts between state policy objectives and FERC regulations governing the wholesale markets. In particular, recent FERC decisions threaten to erect new barriers to the ability of

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FERC ¶ 61,127 (Feb. 15, 2018) ("Order No. 841"), *order on rehearing and clarification*, Order No. 841-A, Docket Nos. RM16-23-001 and AD16-20-001, 84 Fed. Reg. 23,902 (May 23, 2019), 167 FERC ¶ 61,154 (May 16, 2019). Brattle Group conducted a study showing that Order No. 841 could spur as much as 50 GW of growth in energy storage investment; *see* https://www.brattle.com/news-and-knowledge/publications/getting-to-50-gw-the-role-of-ferc-order-841-rtos-states-and-utilities-in-unlocking-storages-potential

[19] *See* https://www.aee.net/articles/ferc-decision-on-energy-efficiency-resources; *Advanced Energy Economy*, 161 FERC ¶ 61,245 (2017).

[20] "Regulation Market", PJM Learning Center, available at https://learn.pjm.com/three-priorities/buying-and-selling-energy/ancillary-services-market/regulation-market.aspx

[21] "Putting Distributed Energy Resources to Work in Wholesale Markets," available at https://info.aee.net/wholesale-markets-policy-briefs

renewables and other advanced energy technologies supported by state policy objectives, or developed under voluntary corporate purchase arrangements, to participate in capacity markets in PJM and elsewhere.

- Transmission planning and ratemaking policies that fail to provide adequate incentives to invest in advanced transmission technologies that would increase the capacity of existing transmission facilities, and in non-wires alternatives to traditional transmission infrastructure.

- Interregional planning processes that prevent adequate bulk transmission buildout, which is needed to unlock the full benefits of renewable energy.

- Some market rules that explicitly prohibit wind and solar from providing certain grid services even when these resources perform on a comparable basis to traditional power plants.

In addition to resolving these and other barriers in the short-term, there is also a long-term need to consider how wholesale electricity markets will need to be designed, and how the bulk electric system will need to be planned and operated, in a future marked by reliance on low- and zero-carbon advanced energy technologies. The current wholesale electricity market designs will face pressures from low-marginal-cost renewable resources, and bulk electric system planners and operators will need tools to better understand and leverage the capabilities of advanced energy technologies (including renewables, electric storage, energy efficiency and demand response resources, and aggregations of distributed energy resources like rooftop solar, fuel cells, and electric vehicles) that have different operating characteristics than the traditional set of generation technologies they have historically relied upon.

There are a number of steps that Congress and FERC can take to remove these barriers, promote technology-neutral markets, and further open wholesale markets to investment in advanced energy technologies that lower emissions. Congress can:

- Encourage FERC to finalize a proposed rule that opens the wholesale markets to greater participation by distributed energy resources;

- Support FERC's consideration of new policies to support the development of advanced transmission technology and non-wires alternatives, consistent with the direction of Congress in the Energy Policy Act of 2005;

- Increase research and engagement between the federal government, industry, and others to develop new modeling practices and market rules to reveal and capture the value of advanced energy and the grid services these technologies provide;

- Remove barriers to maximum advanced energy penetration in wholesale markets by encouraging RTOs/ISOs and bulk electric system operators to update modeling practices to take into account proper forecasting and the capabilities of advanced energy and provide resources to grid operators to ensure implementation of rules occurs in a timely way;

- Support federal funding for programs to enable greater adoption of advanced energy technologies in wholesale markets, including pilot projects to demonstrate the ability of advanced energy to provide innovative solutions to energy challenges;

- Encourage FERC—whether through policy statements, technical conferences, or additional updates to tariffs—to continue to review existing barriers to technology-neutral markets that can preclude advanced energy resources from competing on equal footing with traditional resources;

- Support reducing barriers to grid interconnection facing renewable energy resources, especially those paired with energy storage technologies, and ensure FERC moves forward with implementation of Order No. 845;

- Renew and strengthen commitments to energy efficiency, energy storage, and electric vehicles through performance standards and financial incentives, particularly as these resources can serve as a wholesale market resource; and

- Recognize the role of and invest in advanced load control technologies to increase demand flexibility and integrate with energy storage and renewable energy resources, which can avoid emissions from low efficiency peaker units and help decarbonization efforts. This includes funding for the Department of Energy and national laboratories for more research and innovative Non-Wires Alternatives (NWAs) and Virtual Power Plant (VPP) pilots as well as continued support by FERC for more aggressive incentives for and integration of advanced energy technologies, including renewable resources, energy storage, and demand-side resources in the wholesale markets.

While progress has been made in wholesale electricity markets, we believe continued action by FERC and Congress to allow advanced energy to compete fully in these markets will further lower costs to consumers, increase grid reliability and resilience, and achieve additional emissions reduction benefits.