UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Grid Reliability and Resilience Pricing Docket No. RM18-1-000

COMMENTS OF THE UNION OF CONCERNED SCIENTISTS

The Union of Concerned Scientists ("UCS") appreciates the efforts of the Commission to examine the proposed rate changes submitted by the U.S. Department of Energy as a Notice of Proposed Rulemaking ("NOPR") filed by the Secretary of Energy ("DOE Proposal"). These comments are prepared in response to the Commission's October 2, 2017, Notice Inviting Comments,[1] ("Notice"). UCS has long been interested in policy that will make the energy supply sustainable, more reliable, more resilient to changing climate, and ultimately less expensive for consumers.

UCS is a national nonprofit organization dedicated to advancing responsible public policies in areas where science and technologies play a critical role. Established in 1969, UCS has created a unique alliance between many of the nation's leading scientists and thousands of committed citizens. The UCS Climate & Energy Program focuses on developing a sustainable energy system—one that is affordable and nondepletable, and that does not degrade natural systems or public health. UCS is headquartered in Cambridge, Massachusetts, where we have replaced 2.5 KW of photovoltaic (PV) generation on our roof installed in 1996 with 13.7 KW of PV generation, and also has offices in Oakland, Chicago and Washington, D.C.

[1] Federal Energy Regulatory Commission, *Grid Reliability and Resilience Pricing*, Notice Inviting Comments (Oct. 4, 2017).

I. Background

The DOE Proposal calls for a rate for cost recovery for plants that are capable of storing 90 days fuel. The Commission issued a request to address certain questions on October 4, 2017. These comments are made with references to a subset of those questions, in the order of their appearance.

II. Questions and Comments on the Proposed Rule

Need for Reform Question 1. What is resilience, how is it measured, and how is it different from reliability? What levels of resilience and reliability are appropriate? How are reliability and resilience valued, or not valued, inside RTOs/ISOs? Do RTO/ISO energy and/or capacity markets properly value reliability and resilience? What resources can address reliability and resilience, and in what ways?

A. The DOE Proposal fails to define resilience. This inadequacy of the request for a new rate is sufficient reason for the Commission to reject the proposal.

The DOE filing makes no effort to define its objective or provide a basis for the Commission to find a benefit the DOE calls "resilience." By this omission, the DOE has failed to support its proposal or allow the Commission to find that current rates are inadequate to provide resilience.

The DOE Proposal states the need for electricity to have three characteristics: reliable, resilient and affordable. These terms are not defined by the DOE and there is no attempt to explain the interaction of an increase in reliability or resilience on affordability, or any means to measure the achievement of affordability or resilience. The DOE Proposal in a paragraph header states "2014 Polar Vortex Exposed Problems with the Resiliency of the Electric Grid" but the paragraphs under that header do not use the word "resilience" in any form.[2]

The next section of the DOE Proposal discusses the absence of payments for attributes, including resiliency. The discussion of compensation for resiliency continues, but does not offer

[2] Federal Energy Regulatory Commission, Notice of Proposed Rulemaking, *Grid Resiliency Pricing Rule*, 46941 (Oct. 10, 2017).

a definition of resiliency. The DOE Proposal includes an excerpt from the DOE's August Staff Report to the Secretary on Electricity Markets and Reliability[3] ("Staff Report") which states "Hydropower, nuclear, coal and natural gas power plants provide "essential reliability services" and fuel assurance critical to system resilience." Where "essential reliability services" have been defined by the North American Electric Reliability Corporation ("NERC"), that list includes a number of unpaid capabilities that can be provided by inverter-based generation (solar, wind and storage). In the end, the DOE Proposal equates resilient generation with fuel-secure generation and abandons the effort to provide a definition of resiliency.[4]

Resilience (and reliability) for the electric power system are desirable goals for the economy and the well-being of everyone, but without a definition and means to evaluate the contribution to serving such goals, a policy or expense cannot be justified. Potential improvements to the electric power system are numerous, and priorities for investments, expenses, or changes to operations must be evaluated if there are costs to be borne. The DOE Proposal does not allow for the Commission to understand how the proposed rate advances the goal of resilience or otherwise contributes to benefits.

The DOE is not working in a vacuum towards the goal of a more resilient electric power system. Recent engineering and scientific efforts, funded by the DOE and the Commission's recognized Electricity Reliability Organization, NERC, have described how to identify and consider improvements in electric power system resilience. Power system operator PJM[5] and

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[3] Department of Energy, Staff Report to the Secretary on Electricity Markets and Reliability, (August 2017) available at https://energy.gov/sites/prod/files/2017/08/f36/Staff%20Report%20on%20Electricity%20Markets%20and%20Reliability_0.pdf.

[4] DOE Proposal 6-7, 11.

[5] PJM Interconnection, *PJM's Evolving Resource Mix and System Reliability,* (March 2017) available at http://www.pjm.com/~/media/library/reports-notices/special-reports/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx.

Lawrence Berkeley National Laboratory[6] have also provided extensive analyses of the subject of resilience. The DOE also made a report to Congress on energy security in compliance with the Fixing America's Surface Transportation (FAST) Act (Pub. L. No. 114-94.[7]

The National Academy of Sciences in 2017 published a thorough discussion on enhancing the resilience of the electricity system funded by the DOE .[8] That report offers a discussion of electric power system resilience that is much broader than suggested in the DOE Proposal: "Resilience is not just about being able to lessen the likelihood that outages will occur, but also about managing and coping with outage events as they occur to lessen their impacts, regrouping quickly and efficiently once an event ends, and learning to better deal with other events in the future." [9]

The National Academy of Sciences went further. "Across the United States, there are differences in the resilience threats faced by power system operators, in the resources dedicated to mitigating them, and in the capabilities available to utilities and other grid operators in restoring their systems after an outage event."[10]

Additionally, the DOE Staff report included a description of resilience used by NERC:

> Infrastructure resilience is the ability to reduce the magnitude and/or duration of disruptive events. The effectiveness of a resilient infrastructure or enterprise depends upon its ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event." Examples of events that test a system's resilience include severe

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[6] See a bibliography of this lab's reports on reliability and resilience at https://emp.lbl.gov/publication-research/46.
[7] The DOE website offers a home page and links for the report and appendices at https://energy.gov/epsa/downloads/valuation-energy-security-united-states-report-congress.
[8] National Academies of Sciences, Engineering, and Medicine. 2017. Enhancing the Resilience of the Nation's Electricity System. Washington, DC: The National Academies Press. https://doi.org/10.17226/24836.
[9] Id., at 10.
[10] Id., at 10-11.

natural events (wildfires, hurricanes, floods, droughts, and earthquakes) and coordinated, extensive physical and cyber-attacks and geomagnetic disturbances.[11]

The DOE Proposal does not make use of these or any other concept of resilience in supporting the proposed rate. The DOE Proposal has settled on a fuel requirement without an analysis. The goal DOE claims it seeks may or may not be advanced by the proposed rate, but without proposing a framework to evaluate the proposed policy-driven rate and the proposed goal, there is nothing available on which to base a decision. Because the DOE Proposal offers no explanation of what will be achieved by the new rate and related policy proposed, in terms of resilience or other benefit for ratepayers, the economy or citizens of the makes use of neither, this proposal cannot be found to be reasonable. The Commission must conclude that this neglect of any science and engineering perspectives on the subject renders a rate based on the DOE Proposal unjust and unreasonable.

Need for Reform Question 2. The proposed rule references the events of the 2014 Polar Vortex, citing the event as an example of the need for the proposed reform. Do commenters agree? Were the changes both operationally and to the RTO/ISO markets in response to these events effective in addressing issues identified during the 2014 Polar Vortex?

A. The Commission should not approve the DOE Proposal because it does not describe how the rate would be applied to eligible generators to enhance their performance above the present, or how the proposal is structured so as to improve reliability in conditions such as seen in the 2014 Polar Vortex or any other threat to reliability.

The DOE Proposal does not address how the proposed payments would have improved conditions during the 2014 Polar Vortex. Instead, the events of the 2014 Polar Vortex demonstrate several ways the DOE Proposal is ill-suited to improve reliability and resiliency of power grid operations.

[11] DOE Staff report at 63, drawing from NERC.

1. The DOE Proposal does not include any measure or obligation for the performance of energy supplies from an eligible generator, under challenging conditions or normal conditions. Throughout the process of making changes in PJM in response to the Polar Vortex, the stakeholder discussions addressed the need for redefining the obligations of capacity resources and strengthening performance penalties and incentives. The DOE Proposal lacks any framework for changed behavior in advance of demanding conditions (which PJM adopted both within and outside the compensation reforms), or any mechanism for penalizing poor performance and rewarding improved performance.

PJM provided analysis of the powerplant performance issues during the Polar Vortex conditions of January 2014. Coal plants totaling capacity of 13,700 MW were among the plants that failed to operate because of inadequate protection of key components from freezing temperatures.[12] In addition to frozen pipes, the DOE Staff report included the warning that coal plants' on-site fuel are no guarantee of cold weather performance because "extreme cold can lead to frozen fuel stockpiles."[13]

2. Unlike the DOE Proposal, the market-based changes made in response to 2014 Polar Vortex provide the RTOs the means to maintain the pricing system and related system operations structure which allows the power system to function reliably across the range of conditions from normal to exceptional.

The DOE Proposal fails in a manner partially addressed by PJM in the changes made after the Polar Vortex. PJM, and ISO-NE made responses to cold weather and reliance on gas by recognizing some additional resources and their value to consumers and reliability in winter

[12] PJM, Analysis of Operational Events and Market Impacts During the January 2014 Cold Weather Events (May 8, 2014) at 25-26. Available at http://www.pjm.com/~/media/library/reports-notices/weather-related/20140509-analysis-of-operational-events-and-market-impacts-during-the-jan-2014-cold-weather-events.ashx.
[13] DOE Staff report at 10-11.

conditions. For example, PJM has moved to make better use of wind's greater production and higher capacity value in winter, but ISO-NE has not. Wind farms and demand response exceeded expectations set by capacity market rules in January 2014.[14] ISO-NE's winter reliability program does not exclude demand response available only in one season, but PJM's does exclude demand response that is not available in all seasons. The combined comments filed today by Environmental Defense Fund, Natural Resources Defense Council, UCS and others discuss in greater detail the flaws in the DOE Proposal reference to the Polar Vortex, as well as the changes made by PJM and ISO-NE to improve thermal plant operations.

Need for Reform Question 3. The proposed rule also references the impacts of other extreme weather events, specifically hurricanes Irma, Harvey, Maria, and superstorm Sandy. Do commenters agree with the proposed rule's characterization of these events? For extreme events like hurricanes, earthquakes, terrorist attacks, or geomagnetic disturbances, what impact would the proposed rule have on the time required for system restoration, particularly if there is associated severe damage to the transmission or distribution system?

A. The DOE Proposal mischaracterizes the impacts of extreme weather events on the delivery of electricity and fails to provide a rational support for the proposed rate treatment.

The DOE suggestion that the impacts on electricity consumers due the extreme weather events mentioned is irrelevant to the DOE Proposal.[15] The number of customer outages due to inadequate generation in the U.S. is vanishingly small. The vast majority of customer outages are due to disturbances on the transmission and distribution systems.[16] System restoration and

[14] PJM, Analysis of Operational Events and Market Impacts During the January 2014 Cold Weather Events (May 8, 2014) at 38. Available at http://www.pjm.com/~/media/library/reports-notices/weather-related/20140509-analysis-of-operational-events-and-market-impacts-during-the-jan-2014-cold-weather-events.ashx.

[15] Extreme weather of many kinds has caused individual power plants to shut down temporarily, as discussed below. However, the impact on power plants from hurricanes, flooding, or extreme temperatures have not been the cause of the customer outages that are raised by the DOE.

[16] Hurricane Irma left more than 16 million people across the southeastern US without the assurance of critical infrastructure dependent on power—first responders, hospitals, drinking water, sewage—being able to keep their operations going. Superstorm Sandy left more than 8 million people in 21 states without power. Storm surge and coastal flooding were major contributors to the damages and subsequent outages. At least 165 electric substations, several large power plants, 7,000 transformers, and 15,000 electrical poles were shut down or damaged. Likewise,

returning electricity consumers to electric service has not been improved in any case because there was more fuel stored on-site.

If the DOE Proposal were adopted, and major system outage were to befall a large portion of the bulk power system, a significant flaw with the DOE Proposal would become evident. First, in the event of a major system outage, the power plants that are in the affected area will also be knocked off-line. Power plants that lose their connection to an operating power system will not continue to operate as long as they remain disconnected from an energized, synchronized power grid. In effect, a major outage cuts off both supply and demand. Thus, with numerous power generators no longer producing electricity, the ability of the system to rapidly recover and restore service, (elements of resilience cited by both NERC and the National Academy of Sciences), depend on the flexibility and nimbleness of the power supply operations. Second, where power is off, the types of powerplants that would be vital to re-start and begin re-establishing customer service are not the types described in the DOE Proposal, i.e. coal and nuclear-fueled units. Such generators, based on steam to drive the generator, require many hours to return to service after shut-down due to the inherent design and thermal requirements of their steam generators. In short, coal and nuclear units are not well suited for addressing black start conditions, or simply the extension of service from operating areas into blacked-out areas.

In addition to failing to provide flexibility and fast starting in recovery from a power system outage, other desired resilience and reliability attributes are missing from steam-based coal and nuclear plants. Coal and nuclear power plants face significant reliability risks due to

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Hurricanes Katrina, Rita, and Wilma in 2005, and Gustav and Ike in 2008 wreaked havoc on the grid in the Southeast and Gulf Coast states. Each knocked out power to one to three million customers and damaged 200 to 500 substations, according to the U.S. Department of Energy. See Julie McNamara, Steven Clemmer, Kristina Dahl, Erika Spanger. 2015. "Lights Out? Storm Surge, Blackouts, and How Clean Energy Can Help." UCS. October. http://www.ucsusa.org/sites/default/files/attach/2015/10/lights-out-full-report.pdf.

extreme weather, heat dissipation problems, safety concerns, terrorist threats, and even siting in flood-prone, low-lying areas required to accommodate fuel transportation.

The potential for a sudden outage at large coal and nuclear plants and transmission facilities means that grid operators must always have generation and transmission reserves on hand to immediately replace them. Because of their size, those facilities also make the remaining power system operations less flexible and more vulnerable to blackouts when they go offline.

Examples provided below illustrate coal and nuclear power plants' operations severely affected due to extreme weather events.

- One of America's largest coal plants, the W.A. Parish Generating Station outside Houston, was forced to shutter two of its units and temporarily convert two more to natural gas after its coal piles were flooded during Hurricane Harvey. Floodwaters saturated the coal piles and cut off rail deliveries to the power plant.[17]
- Two Florida nuclear power plants, Turkey Point and St. Lucie, were shut down as a safety measure because of Irma's arrival.[18]
- Tropical storm Jose created operational problems for Pilgrim Nuclear Power Station due to rising ocean water temperatures.[19]
- In February 2011, freezing temperatures during a cold snap in Texas disabled 152 power plants—mostly coal and natural gas—leading to rolling blackouts across the state.[20]
- During extremely hot weather, especially droughts, lakes and rivers may be too warm or lack enough water to cool large thermal power plants. For example, in 2007 and again in 2010 and 2011, the temperature of the Tennessee River rose above 90°F. That ensured the temperature of water discharged from the Tennessee Valley Authority's Browns Ferry nuclear power station would exceed permitted limits, and forced extended reductions in output from the plant.[21]
- Entergy's A.B. Paterson plant was submerged under six feet of water during Hurricane Katrina. Ultimately 16 power plant units in the region were affected by Katrina, including

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[17] Storrow, Benjamin. 2017. "Flooded Texas coal piles dampen reliability arguments." E&E News. September 29. https://www.eenews.net/climatewire/stories/1060062093.

[18] Delkic, Melina. 2017. "Florida Nuke Plant Did Not Meet Fed Safety Guidelines as Irma Roared." CNN. September 11. http://www.newsweek.com/turkey-point-nuclear-plant-hurricane-irma-663188.

[19] Legere, Christine. 2017. "Pilgrim's power reduced to 80 percent." Cape Cod Times. September 21. http://www.capecodtimes.com/news/20170921/pilgrims-power-reduced-to-80-percent.

[20] American Wind Energy Association (AWEA). 2011. Wind energy helps save day as fossil fuel plants falter and electricity demand surges across plains due to winter storm. Online at http://www.awea.org/newsroom/pressreleases/ release_02-04-11.cfm.

[21] Nuclear Regulatory Commission (NRC). 2011. Power reactor status reports, July. Online at http://www.nrc.gov/reading-rm/doc-collections/event-status/ reactor-status.

six units (888 MW) that suffered sufficient flood damage as to render them sidelined for repairs before they could return to service.

- The map below illustrates electricity and water supplies at risk due to heat and drought. These electricity-water collisions have occurred primarily at large coal and nuclear plants in the eastern half of the country. These collisions include: Not having enough water, requiring power plants to cut back production or even shut down. Incoming water is too warm, forcing power plants to reduce production, often when it's needed most. Outgoing water is too warm, which can harm or kill wildlife. Climate change will only make these and other problems more frequent and severe in the future.

Figure 1. Power plants affected by water shortages or excessive water temperatures. Source: UCS

The DOE Staff report provides an alternative to the DOE Proposal's emphasis on fuel for steam units, namely transmission. The DOE Staff report describes transmission investments as providing reliability, resilience, and cost savings. The report refers to recent studies of the net customer savings from transmission investment, such as the $12 B in customer cost reductions from $3.4 B investment in transmission in Southwest Power Pool from 2012 to 2014.[22]

[22] DOE Staff Report at 75.

Just as diversifying investments strengthens a financial portfolio, adding new energy sources and technologies to the electricity grid can fortify its portfolio—improving its reliability in the process. Renewable resources are less vulnerable to prolonged interruptions in fuel supplies, and because renewable energy technologies are more modular than conventional power plants, the impact on the grid is usually insignificant when weather damages individual facilities.

Solar and storage have a unique advantage over traditional fossil-fuel generation. For instance, gas-powered generators are reliant upon a fuel source that needs a functional supply line to be distributed. Solar's fuel source, sunlight, does not. This is a valuable attribute when demand for fuel outstrips supply or flooded out roads block access to those in need. Battery storage helps ensure that electricity stays functional when storms hit.

Droughts and sustained high temperatures in various parts of the U.S. have forced fossil and nuclear plants to operate at reduced output or even go offline, while the recent drought in California greatly reduced the state's hydroelectric output. Wind energy and solar photovoltaics continued to generate as expected during these events, as they require no water to operate.

The following examples demonstrate that preparedness and investment in resilient technologies such as renewable energy and energy storage help to keep power on and hasten the restoration of power in the face of catastrophic storms.

- After hurricane Irma, solar kept Florida homes and a city's traffic lights running. Using smart grid technologies helped to better detect and manage outages and target restoration. And energy storage with solar panels showed how distributed power could speed future storm recovery.[23]
- Apollo Elementary School, a Brevard County school serving as a special needs shelter during hurricane Irma was connected to emergency solar power. The school equipped

[23] Gilpin, Lyndsey. 2017. "After the Hurricane, Solar Kept Florida Homes and a City's Traffic Lights Running." InsideClimate News. September 15. https://insideclimatenews.org/news/15092017/after-hurricane-irma-solar-florida-homes-power-gird-out-city-traffic-lights-running.

with a 10-kilowatt solar array and battery storage was able to provide electricity at a time when 4.4 million Florida Power & Light customers lost service.[24]

- As Hurricane Harvey was battering the coast of Texas, most coastal wind power projects remained online and operating.[25] Wind turbines that experienced extreme conditions in Papalote Creek Wind Farm near Corpus Christi came back online once the local power grid was restored.[26]
- PJM, the largest grid operator in the US, released a study that quantifies the reliability of possible future energy mixes. It found that portfolios with very large amounts of wind energy, dozens of times greater than the current mix, scored among the highest for reliability and resilience.[27]
- During Texas cold snap of February 2011, local wind power facilities kept operating and provided enough electricity for hundreds of thousands of homes, reducing the severity of the blackouts. According to Trip Doggett, CEO of the Electric Reliability Council of Texas, "We put out a special word of thanks to the wind community because they did contribute significantly through this timeframe. Wind was blowing, and we had often 3,500 megawatts of wind generation during that morning peak."[28]
- The Massachusetts Community Clean Energy Resiliency Initiative is funding municipal clean energy projects to supply back-up power to water and wastewater treatment plants, emergency shelters, police departments and communications facilities. When it's not an emergency, these clean energy projects are also valuable for generating electricity for everyday use.[29]
- In 2008, the Bergen County Utilities Authority (BCUA) installed a 2.8 megawatt combined heat and power (CHP) system adjacent to its Water Pollution Control Facility (WPCF) in Little Ferry, NJ. The CHP system primarily runs on the treatment facility's biogas with natural gas as a backup, and generates enough electricity to meet approximately 85 percent of the treatment facility's electric load. The system also generates enough heat to heat the building and the sludge digester system. When Hurricane Sandy hit the region in 2012, the WPCF continued to operate without issue,

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[24] Dean, James. 2017. "Solar power helped shelter shine through Irma." Florida Today. September 24. http://www.floridatoday.com/story/news/2017/09/24/solar-power-helped-shelter-shine-through-irma/694322001/.
[25] Mahan, Simon. 2017. "Texas Wind Farms Survive Hurricane Harvey." Southern Alliance for Clean Energy. August 30. http://blog.cleanenergy.org/2017/08/30/texas-wind-farms-survive-hurricane-harvey/.
[26] Gold, Russell. 2017. "In Big Test of Wind Farm Durability, Texas Facility Quickly Restarts After Harvey." The Wall Street Journal. September 1. https://www.wsj.com/articles/texas-wind-farm-back-online-1504294083.
[27] PJM Interconnection. 2017 *PJM's Evolving Resource Mix and System Reliability* available at http://www.pjm.com/~/media/library/reports-notices/special-reports/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx.
[28] Galbraith, K. 2011. An interview with the CEO of the Texas grid. Texas Tribune, February 4. Online at https://www.texastribune.org/2011/02/04/an-interview-with-the-ceo-of-the-texas-grid/.
[29] Massachusetts Department of Energy Resources (MA DOER). No date. Community Clean Energy Resiliency Initiative. Boston, MA. Online at http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/resiliency/resiliency-initiative.html.

unlike many of its counterparts in the region that, when left without power, were forced to dump raw or partially treated sewage into area waterways.[30]

Eligibility Question 1. In determining eligibility for compensation under the proposed rule, should there be a demonstration of a specific need for particular services? What should be the appropriate triggering and termination provisions for compensation under the proposed rule?

A. The DOE Proposal is unreasonable as it has failed to quantify the need for the bulk power system to include some power plants that have fuel on site.

The DOE Proposal does not meet the Commission's reasonableness test because it does not offer any measure, or reasoning, that reliability or resilience will be improved by its adoption. The DOE proposal fails to make a logical or quantified explanation that a need can be defined, quantified and demonstrated. Without such a need, the Commission should not support the proposed expenditures by regional markets to keep plants from closings. While the DOE describes the changing mix of generation across the US, and reports numbers of plant closings, there is no attempt to explain how many plants with fuel stored on-site are needed in any particular market to achieve the DOE's goals of reliability and resilience, or how to measure the resilience of a power system. The DOE has not provided any means to assess the likelihood of a market rule change successfully meeting the goal of making the power system resilient.

Eligibility Question 2. As the proposed rule focuses on preventing premature retirements, should a final rule be limited to existing units or should new resources also be eligible for cost-recovery? Should it also include repowering of previously retired units? Alternatively, should there be a minimum number of MW or a maximum number of MW for resources receiving cost-of service payments for resilience services? If so, how should RTOs/ISOs determine this MW amount? Should this also include locational and seasonal requirements for eligible resources?

[30] ICF International. 2013. Combined heat and power: Enabling resilient energy infrastructure for critical facilities. ORNL/TM- 2013/100. Oak Ridge, TN: Oak Ridge National Laboratory. Available at http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_critical_facilities.pdf.

A. The Commission should reject the possibility that the DOE Proposal will be applicable to existing, new resources or to previously retired or idled units.

The DOE Proposal has not defined how the proposed rate will improve reliability or resiliency. The DOE Proposal includes no means to define a sufficient or desired level of eligible resources or services from eligible resources. There is no measure offered for establishing a minimum number of MW or a maximum number of MW. Because the DOE Proposal failed to define what contribution to reliability or resiliency is provided by the proposal, no science or engineering explanation that supports how the proposal advances a legitimate and coherent policy goal, the Commission should not allow any resource, existing, new or previously idled or retired to receive the proposed rate.

Eligibility Question 3. The proposed rule references the retirement of coal and nuclear resources and a concern from Congress about the potential further loss of valuable generation resources as a basis for action. What impact has the retirement of these resources had on reliability and resilience in RTOs/ISOs to date? What impact on reliability and resilience in RTOs/ISOs can be anticipated under current market constructs?

A. The DOE has not supported the claim that retirements of uneconomic generation creates a reliability impact.

The retirement of power plants in the RTOs/ISOs has not diminished the reliability of the electric power system. Reliability is closely watched, with regular comprehensive reviews provided by NERC. The DOE Proposal does not reflect the NERC assessments of grid reliability. The DOE proposal contradicts NERC and does so despite the fact that the NERC reliability assessment is cited in the DOE Staff report.[31] NERC's *State of Reliability 2017* report[32] states that the bulk power system is reliable today despite the recent plant retirements.

[31] DOE Staff Report at 63.
[32] North American Electricity Reliability Corporation, *State of Reliability 2017* (June 2017) available at http://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/SOR_2017_MASTER_20170613.pdf

The DOE Proposal also missed the importance of the quantification NERC provides in its annual Long-Term Reliability Assessment of the power supply looking forward 10 years. This December 2016 report quantifies single-fuel dependency in four regions where gas is projected as the majority of on-peak capacity by 2021.[33] This discussion highlights vulnerabilities in Texas (ERCOT), Florida, the West (WECC-CAMX) and New England. If the DOE is concerned about these projected outcomes quantified, ranked and highlighted for the four regions with the greatest reliance on natural gas-fired generation, the design of the DOE Proposal fails to address three of these four regions. The trend in retirements of old power plants is present outside the markets that DOE insists are problematic. NERC does not attribute the retirements or reliance on natural gas to market designs, as there are no organized markets that shape entry of competing plants and exist of older plants in ERCOT, Florida or most of the West. These three non-RTO regions noted by NERC are experiencing (and managing) retirements without the markets that DOE seems to blame for the retirements. The anticipated changes in electric power supply mix do not depend on the market pricing issues DOE has raised.

Eligibility Question 4. If technically capable of sustaining output for a sufficient duration (and meeting other relevant requirements), should resources such as hydroelectric, geothermal, dual-fuel with adequate on-site storage, generating units with firm natural gas contracts, or energy storage (each of which might have a demonstrable store of energy to draw upon to sustain an electrical output, if not necessarily fuel) also be eligible? Why or why not? If technical capability is the appropriate criterion for eligibility, what specific technical capability should be required to be eligible?

A. The DOE Proposal does not provide the Commission with a basis for determining relevant requirements or capabilities for eligibility and thus should be rejected as unreasonable.

[33] North American Electricity Reliability Corporation, *2016 Long-Term Reliability Assessment* (December 2016) available at http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/2016%20Long-Term%20Reliability%20Assessment.pdf

The DOE proposed rule is unreasonable as it lacks a mechanism for the measurement an affected generating unit's incremental contribution to reliability or resilience, and lacks any obligation or performance for a recipient of the proposed rate. Unclear if this is a cost-of-service rate or is for services provided. The DOE Proposal offers no explanation for interaction of units receiving payment under the DOE Proposal with market-based systems used by ISOs to operate the bulk power system reliably.

The DOE Proposal lacks a fundamental supporting argument that the proposed rate will provide benefits. This was a need identified by the DOE Staff report prepared for the expressed purpose of developing the DOE Proposal. The DOE Staff report advises:

> It is important that policymakers have a clear understanding of the true costs and benefits of services to the grid, as well as an understanding of the tradeoffs between desirable attributes like reliability, flexibility, and affordability.
>
> A continual comprehensive regional and national review is needed to determine how a portfolio of domestic energy resources can be developed to ensure grid reliability and resilience.[34]

To the specific subject of Eligibility Question 4 in the Supplemental Notice, the DOE Staff report addressed the capability of energy storage already on the grid and in active commercial deployments that improve resilience and recovery following severe events.[35]

Demonstrations of solar generation capabilities to provide "essential reliability services" have recently been published by the California ISO, California Energy Commission, National

[34] DOE Staff Report at 12, 14.
[35] Id., at 73.

Renewable Energy Laboratory and First Solar.[36] An earlier documentation of wind generation capacity to provide reliability and ancillary services has been made by NREL, and deployed commercially by Xcel operators in Colorado.[37]

Other Question 3. Please describe any alternative approaches that could be taken to accomplish the stated goals of the proposed rule.

A. UCS understands the goal of the proposal is to encourage the availability of energy and reliability-related services at times or in forms that are not presently compensated.

The development of an alternative approach to the goal of a more resilient and better performing electric power system can be done in a reasonable manner if the approach is guided by two principles. 1) The needs of the power system are deliberately defined, both in type of needed service and in quantity; and 2) payments or other means to recognize and account for such services when any resource is able or obligated to provide the services, without discrimination by type of resource.

Other Question 4. What impact would the proposed rule have on consumers?

Two related cost impacts will fall on consumers from the proposed rule. These are the cost of payments to plants that are uneconomic in the market, and the cost of impacts from pollution from the continued operation of plants that are uneconomic and would be paid under the DOE Proposal.

1. Carbon Emissions

The DOE Proposal opens the question of costs of the electric power supply and brings forward externalities. The DOE Proposal at page 5 cites the IHS Markit Report *Ensuring*

[36] Loutan, Clyde; Vahan Gevorgian. Using Renewables to Operate a Low Carbon Grid: Demonstration of Advanced Reliability Services from a Utility-Scale Solar PV Plant. 2016. California Independent System Operator. Available at https://www.caiso.com/Documents/UsingRenewablesToOperateLow-CarbonGrid.pdf

[37] Ela, Erik; Vahan Gevorgian et al. Active Power Controls from Wind Power: Bridging the Gaps. 2014. National Renewable Energy Laboratory. Available at https://www.nrel.gov/docs/fy14osti/60574.pdf

Resilient and Efficient Electricity Generation: The Value of the Current Diverse US Power Supply Portfolio, which argues "From the consumer perspective, the objective of a grid-based power system is to minimize the cost of reliably balancing power system demand and supply… at a price that internalizes all costs."[38] The impacts of operating plants create costs for consumers, and the impacts and costs from coal plant operations are greater than the impacts and costs of other plants. The evaluation of impacts of the DOE Proposal must include the impact of increased carbon dioxide ("CO2") emissions that would result from the extension of coal plant operations.

U.S. Supreme Court has determined climate change-causing emissions cause injury, and thus costs.[39] The costs from increased burning of coal due to the DOE proposed rule can only be roughly estimated at this time, as the operational changes to the grid and individual power plants that would follow implementation of the DOE Proposal have not been described. To offer the Commission an initial estimate of costs due to increased CO2 emissions, we have calculated the CO2 emissions from existing coal-burning generators that appear to be eligible for the payments proposed by the DOE, though as noted above the eligibility and performance requirements in the DOE Proposal are unclear.

UCS found over 50 GW of existing coal capacity that would potentially be eligible for the proposed subsidy. Looking at the full universe of coal generating units operating at the end of 2016 in the United States[40], we selected only those that were located within PJM, MISO,

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[38] IHS Markit *Ensuring Resilient and Efficient Electricity Generation: The Value of the Current Diverse US Power Supply Portfolio* at 18. September 2017 available at https://cdn.ihs.com/www/pdf/Value-of-the-Current-Diverse-US-Power-Supply-Portfolio.pdf

[39] See discussion of U.S. Supreme Court, Massachusetts *v.* EPA, Decided April 2, 2007, Docket #05-1120 at http://www.ucsusa.org/our-work/center-science-and-democracy/promoting-scientific-integrity/climate-change-endangerment-report.html#.We4BI1tSxQI.

[40] Richardson, J., Gomberg, S., and McNamara, J. 2017. *A Dwindling Role for Coal: Tracking the Electricity Sector Transition and What It Means for the Nation*. Cambridge, MA: Union of Concerned Scientists. Online at www.ucsusa.org/coaltransition.

NYISO, or ISO-NE, and those that are known to be merchant unregulated units. We summed the 2016 CO2 emissions from these coal generators, based on data from S&P Global[41] and EPA's Continuous Emissions Monitoring System.[42] Using the social cost of carbon[43], we estimate that the coal units potentially eligible for payments under the DOE Proposal create annual costs of about $9 billion (2015$) from emitted CO2. Externalities from other pollutants are not included in this estimate.

Another measure of the costs of keeping uneconomic coal plants operating and delaying the transition to cleaner alternatives, results in indirect public health, climate and environmental costs to consumers and society. For example, our Dwindling Role for Coal study found that retiring 59 GW of coal capacity between 2008 and 2016, and converting another 13 GW of coal capacity to other fuels, resulted in significant reductions in air pollution and provided public health benefits worth an estimated $250 billion over this timeframe.[44]

2. Direct payments for uneconomic plants

The DOE Proposal would increase costs to consumers by otherwise keeping uneconomic plants from retiring and replacing them with lower cost alternatives like natural gas, wind, solar, energy efficiency, and demand response. For example, in the recent UCS study, we found that utilities have announced that 51 GW or 18 percent of the currently operating coal generating

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[41] S&P Global Market Intelligence (S&P Global). 2017. SNL interactive. New York. Online at www.snl.com (paywall restricted), accessed October 23, 2017.

[42] U.S. Environmental Protection Agency (U.S. EPA). 2016. Air Emission Measurement Center: Continuous Emission Monitoring Systems. Washington, DC: U.S. EPA. Online at https://www.epa.gov/emc/emc-continuous-emission-monitoring-systems.

[43] Interagency Working Group on the Social Cost of Greenhouse Gases. 2016. Technical support document: Technical update of the social cost of carbon for regulatory impact analysis under Executive Order 12866. Washington, DC: United States Government. Archived at https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf, accessed June 22, 2017.

[44] Richardson, J., Gomberg, S., and McNamara, J. 2017. *A Dwindling Role for Coal: Tracking the Electricity Sector Transition and What It Means for the Nation*. Cambridge, MA: Union of Concerned Scientists. Online at www.ucsusa.org/coaltransition.

capacity in the U.S. will be retired or converted to natural gas between 2017 and 2030.[45] The study also found that an additional 57 GW or 20 percent of current coal capacity is uneconomic today compared to existing natural gas combined cycle plants and therefore could face retirement, as shown in Figure 2 below. (A subset of these plants are located in RTOs and in states that are not subject to cost of service regulation that would be eligible under the DOE proposal.)

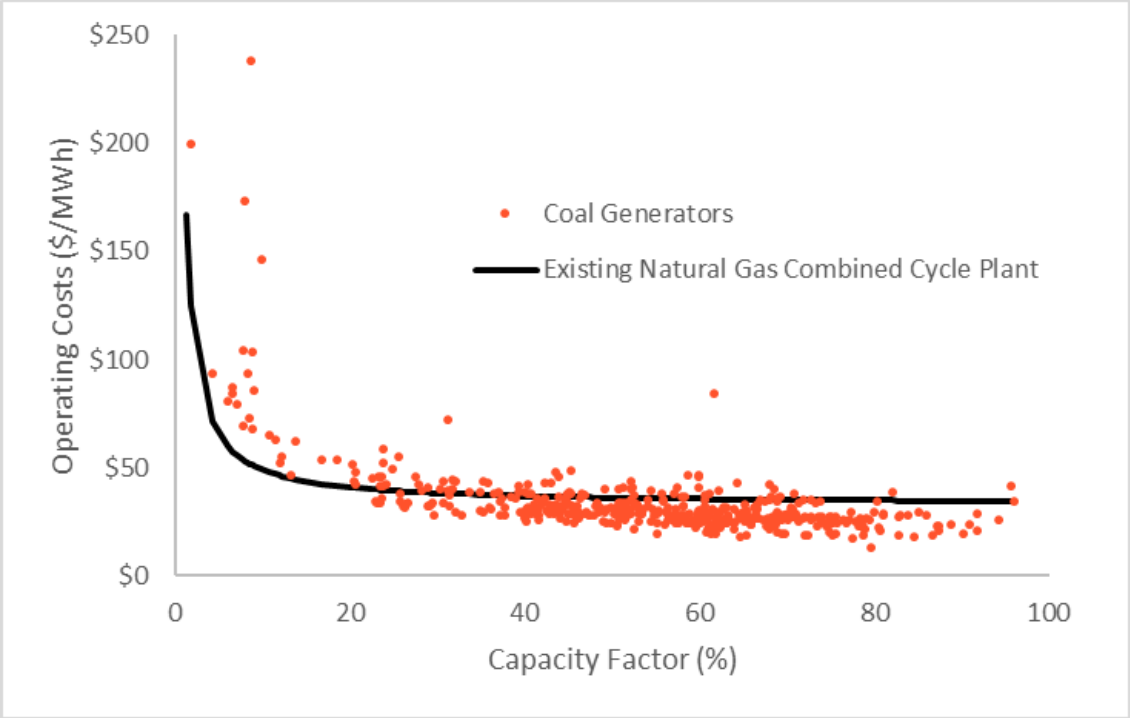

Figure 2 Increased costs from coal generation. Source: UCS, Dwindling Role for Coal.

Depending on how the proposed payment is structured, the proposal could increase wholesale electricity prices by changing the dispatch curve and increasing the marginal price of electricity. In contrast, low variable cost technologies like wind and solar lower the marginal cost of electricity for all consumers by shifting the dispatch curve to the right and displacing higher cost generation on the margin. During the Polar Vortex in 2014, wind power saved

[45] Ibid.

consumers an estimated $1 billion over the course of two days by reducing the need to purchase higher cost replacement energy during a time when natural gas and wholesale electricity prices were spiking because many coal and natural gas plants were offline and pipeline capacity was limited due to the cold weather.[46]

Rather than proposing a fuel and technology neutral approach for providing essential reliability and resilience services, the DOE Proposal picks winners and losers by providing additional subsidies to coal and nuclear plants without a clearly quantifiable resilience benefit. Fossil fuels and nuclear have already have received far more subsidies than renewables. Between 1947 and 2015, $619 billion (65%) in subsidies went to fossil fuels, $197 billion (21%) to nuclear, $27 billion (3%) to wind, and $114 billion (12%) for biofuels and other renewables, according to data collected by AWEA from a variety of sources.[47] Many of the subsidies for fossil fuels and nuclear are part of the permanent tax code, while federal tax credits for wind and solar are scheduled to phase-out in the near future.

A 2011 UCS analysis[48] showed that existing nuclear plants have already received subsidies that have cost taxpayers more than the market price of power, and they continue to receive ongoing subsidies ranging from 1-6 cents per kilowatt-hour. In contrast, a 2016 NREL and LBNL analysis showed that the public health and environmental benefits of existing state RPS policies are worth $75 per megawatt-hour for each megawatt-hour produced.[49]

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[46] Hresko, G., M. Goggin. Wind Energy Saves Consumers Money During The Polar Vortex. (2015) Washington, D.C. American Wind Energy Association. On-line at http://awea.files.cms-plus.com/AWEA%20Cold%20Snap%20Report%20Final%20-%20January%202015.pdf

[47] Wanner, C. 2016. New analysis: Wind energy less than 3 percent of all federal energy incentives. July 19, 2016. American Wind Energy Association. http://www.aweablog.org/14419-2/

[48] Nuclear Power: Still Not Viable without Subsidies (2011). Cambridge, MA: Union of Concerned Scientists. On-line at http://www.ucsusa.org/nuclear-power/cost-nuclear-power/nuclear-power-subsidies-report#.We4l-FtSxQJ

[49] Wiser, R., G. Barbose et al. A Retrospective Analysis of the Benefits and Impacts of U.S. Renewable Portfolio Standards. (2016). National Renewable Energy Laboratory. On-line at www.nrel.gov/docs/fy16osti/65005.pdf.

III. Summary

The proposed rule submitted by the DOE fails to meet several requirements that would allow an evaluation and assessment of the resulting rate for wholesale power in several large regions of the U.S. The DOE Proposal has not defined the need for a set of services, not defined the services, and not defined the performance improvements sought or expected from generators eligible for the proposed payments. The DOE has not supported its proposal with evidence, or the body of science-backed reports on the subject that have been published in recent months, many of which were funded and directed by the DOE. The DOE Proposal also does not explain how payments would be made, how the remaining electricity markets would operate, and the resulting rates would be just and reasonable. The Commission should not approve this proposed rule with this lack of evidence and detail regarding impacts on consumers, reliability and capital investment in the electric power industry.

Respectfully submitted on this 23rd day of October 2017.

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