

March 29, 2018

VIA COURIER

The Honorable James Richard Perry
Secretary of Energy
United States Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Re: Request for Emergency Order Pursuant to Federal Power Act Section 202(c)

Dear Secretary Perry:

Pursuant to Section 202(c) of the Federal Power Act (“FPA”),¹ Section 301(b) of the Department of Energy (“DOE”) Organization Act,² and certain of the DOE’s Rules of Practice and Procedure,³ FirstEnergy Solutions Corp. (“FirstEnergy Solutions”), on behalf of its named subsidiaries (“Applicants”),⁴ respectfully requests that the Secretary of Energy (“Secretary”) find that an emergency condition exists in the footprint of the PJM Interconnection, L.L.C. (“PJM”) that requires immediate intervention by the Secretary, in the form of a Section 202(c) emergency order directing: (a) certain existing nuclear and coal-fired generators in PJM,⁵ as detailed herein, to enter into contracts and all necessary arrangements with PJM, on a plant-by-plant basis, to generate, deliver, interchange, and transmit electric energy, capacity, and ancillary services as needed to maintain the stability of the electric grid and (b) PJM to promptly compensate at-risk merchant nuclear and coal-fired power plants for the full benefits they provide to energy markets and the public at large, including fuel security and diversity, as detailed herein.

PJM has done little to prevent this emergency despite the numerous signs for many years that the emergency was coming. Nuclear and coal-fired generators in PJM have been closing at a rapid rate⁶—putting PJM’s system resiliency at risk—and many more closures have been

¹ 16 U.S.C. § 824a(c).

² 42 U.S.C. § 7151(b).

³ 10 C.F.R. §§ 205.370-205.373.

⁴ The named subsidiaries are: FirstEnergy Generation, LLC, FirstEnergy Nuclear Generation, LLC, FirstEnergy Nuclear Operating Company, and FirstEnergy Generation Mansfield Unit 1 Corp. The foregoing entities are all wholly owned subsidiaries of FirstEnergy Solutions Corp. which, in turn, is a wholly owned subsidiary of FirstEnergy Corp., a publicly-traded, utility holding company headquartered in Akron, Ohio.

⁵ A list of the nuclear and coal-fired generating plants in PJM believed to be currently operating is provided as Attachment A hereto. As explained in Section II.F, only a subset of these plants would be subject to the requested Order.

⁶ In the past four years, over 11,000 MW of coal-fired generation within the PJM footprint has closed, the equivalent of a dozen large power plants. MONITORING ANALYTICS, LLC, 2017 STATE OF THE MKT. REPORT FOR

announced.⁷ PJM continues to claim that all is well with its system,⁸ but at the same time shows it does not have a clear view of what resilience is, how to measure it, or how to ensure it.⁹ PJM has demonstrated little urgency to remedy this problem any time soon¹⁰—so immediate action by the Secretary is needed to alleviate the present emergency.

I. BACKGROUND AND SUMMARY

It is in the national interest to ensure a dependable, affordable, safe, fuel-secure, and clean supply of electricity produced by a diverse array of energy resources, including coal, natural gas, nuclear material, flowing water, and renewable resources. Such diversity of generation enhances dependable and resilient electric supply, reduces electricity price volatility, ensures the Nation's economic and physical security, and promotes economic development. As you stated recently, "America's greatness depends on a reliable, resilient electric grid powered by an 'all of the above' mix of generation resources" that "must include traditional baseload generation with on-site fuel storage that can withstand major fuel supply disruptions caused by natural and man-made disasters."¹¹ Indeed, "[o]ur economy, government and national defense all depend on electricity. Therefore, ensuring a reliable and resilient electric supply and corresponding supply chain are vital to national security."¹²

PJM, VOL. 2: DETAILED ANALYSIS 544 tbl.12-5 (Mar. 8, 2018), (listing coal unit retirements of 2,239 MW, 7,064.8 MW, 243 MW, and 2,038 MW in 2014, 2015, 2016, and 2017, respectively) http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2017.shtml ("2017 PJM Report").

⁷ See Section II.B, *infra*.

⁸ See, e.g., Comments and Responses of PJM Interconnection, L.L.C. at 4, *Grid Resilience in Regional Transmission Organizations and Independent System Operators*, FERC Docket No. AD18-7-000 (Mar. 9, 2018) ("To be clear, the PJM [Bulk Electric System ("BES")] is safe and reliable today – it has been designed and is operated to meet all applicable reliability standards. However, improvements can and should be made to make the BES more resilient against known and potential vulnerabilities and threats. In many cases, resilience actions are anchored in, but go beyond what is strictly required for compliance with, the existing reliability standards.") ("PJM Comments"); Initial Comments of PJM Interconnection, L.L.C. on the United States Department of Energy Proposed Rule at 25, *Grid Reliability and Resilience Pricing*, FERC Docket No. RM18-1 (Oct. 23, 2017) ("[T]he performance of the PJM system in response to incredibly taxing events like the 2014 Polar Vortex demonstrate the reliability and resilience of the system created by effective transmission planning and development and the energy and capacity markets.").

⁹ See, e.g., PJM Comments at 3-4. *Contrast* Response of the New York System Operator, Inc. at 1, *Grid Resilience in Regional Transmission Organizations and Independent System Operators*, FERC Docket No. AD18-7-000 (Mar. 9, 2018) (referring to "efforts already underway (or being considered) to ensure continued reliable operation and bolster resiliency in response to the evolving nature of the bulk power system in New York").

¹⁰ PJM indicates that it will follow any FERC mandate to study the resiliency issue and, *if* changes are needed, pursue solutions. PJM Comments at 5-6. But the emergency exists presently, not in the future, and immediate action is needed *now*, not more time to study.

¹¹ Letter from Rick Perry, U.S. Sec'y of Energy, to Chairman & Comm'rs of FERC at 1 (Sept. 28, 2017) ("Secretary NOPR Letter").

¹² *Id.* at 2.

The Nation depends heavily on a steady and dependable supply of electricity at all times. Electricity both figuratively and literally powers the Nation—its homes, its businesses, its industries, government buildings, and defense installations. Electricity is thus vital not only to the health, safety, and welfare of the Nation, but also to its economic and physical well-being. Our adversaries understand this too. As explained by Dr. Paul Stockton, former Assistant Secretary of Defense, the Nation’s adversaries “may seek to disrupt U.S. defense capabilities by attacking the critical infrastructure on which our military bases rely. . . . The power grid and fuel supplies for power generation are potential targets for these adversaries.”¹³ The importance of the electric grid and its fuel supply network to our Nation’s well-being cannot be overstated.

Yet, as DOE is undoubtedly aware, threats to the Nation’s power supply and grid are real and can no longer be ignored. The Nation’s security is jeopardized if DOE does not act now to preserve fuel-secure generation and the diversity of supply.¹⁴ The very diversity of supply that baseload nuclear and coal-fired units provide is being lost more and more each day as more and more of these plants retire because their fuel security and resiliency are not properly recognized and valued by the current administrative market rules. Rather, we, as a Nation, “need to properly recognize the value of each resource, being mindful of its role in our national defense [and] economic security” and, in this regard, “account for the value of on-site fuel storage capability” of nuclear and coal-fired generating resources.¹⁵ To this effect, immediate action is needed to ensure that such traditional baseload generation receives compensation commensurate with the value it provides to the Nation and thus remains in service and available to power the Nation in times of need. As you have noted, “urgent action must be taken to ensure the resilience and security of the electric grid, which is so vitally important to the economic and national security of the United States.”¹⁶

The recent cold weather in the East has provided a real-time, real-life demonstration as to why immediate action is so critical to ensure the health and safety of the Nation. From December 27, 2017, through January 8, 2018, the eastern U.S. saw extremely cold temperatures and spiking electric demand, which would likely have been far worse had it occurred only two weeks later after the holiday season ended. If not for the over-performing nuclear and coal-fired generating plants in PJM,¹⁷ the eastern portion of the country would likely have seen grid reliability impacts,

¹³ Comments of Exelon Corp., Testimony of Paul Stockton at 5-6, *Grid Reliability and Resilience Pricing*, FERC Docket No. RM18-1-000 (Oct. 23, 2017).

¹⁴ Secretary NOPR Letter at 8 (“If, for example, we lose our educated workforce or no longer have the ability to build and operate our baseload plants because of short-sighted policies, it will not only weaken our workforce, but will threaten our energy dominance and national security.”).

¹⁵ *Id.*

¹⁶ Letter from Rick Perry, U.S. Sec’y of Energy, to Kevin McIntyre, Chairman, FERC at 2 (Dec. 8, 2017) (“Secretary Extension Letter”).

¹⁷ See, e.g., Tim Loh, Chris Martin & Naureen S. Malik, *America’s Deep Freeze is Aiding Coal and Sending Power Up*, BLOOMBERG (Dec. 28, 2017), <https://www.bloomberg.com/news/articles/2017-12-28/america-s-deep-freeze-is-aiding-coal-and-sending-power-surgin> (“In the PJM market . . . coal has once again surged past natural gas to become the biggest fuel for power generation.”); Tiffany Hsu, *Deep Freeze in U.S. Creates Heating Squeeze for Homeowners and Utilities*, N.Y. TIMES (Jan. 3, 2018),

as natural gas plants significantly underperformed in large part due to natural gas price spikes and supply interruptions.¹⁸ As a recent DOE study of this cold weather event found (the “NETL Report”), nuclear and coal-fired generation provided 70 percent of output during the event and “coal units in PJM were uniquely positioned to provide the resilience needed at this critical point in time,” providing “74 percent of incremental energy.”¹⁹ The study went on to conclude that:

*In the case of PJM, it can also be shown that the demand could not have been met without coal. At peak demand, January 5, 2018, natural gas prices exceeded \$95/MMBtu in eastern PJM. Had coal been removed, a 9-18 GW capacity shortfall would have developed, depending on assumed imports and generation outages, leading to system collapse.*²⁰

As the report stated, “[e]xperience with such blackouts indicates the potentially enormous toll in both economic losses and human suffering associated with widespread lack of electricity.”²¹

<https://www.nytimes.com/2018/01/03/business/heating-homeowners-winter.html> (noting that due to high heating demand, “[m]any utilities turned to coal and oil to generate electricity as the price of natural gas, their usual fuel of choice, surged”); Jeremiah Shelor, *Extreme Cold Drives Record-Setting Week in NatGas Cash; Futures See Warm-Up Ahead*, NATURAL GAS INTELLIGENCE (Jan. 5, 2018), <http://www.naturalgasintel.com/articles/112977-extreme-cold-drives-record-setting-week-in-natgas-cash-futures-see-warm-up-ahead> (“With blizzard conditions arriving late in the week along the East Coast just in time to pile on after recent bitterly cold temperatures, natural gas spot price blowouts ran rampant The conditions driving the exorbitant cash prices appeared to be a perfect storm of widespread weather-driven demand and pipeline constraints.”); PJM INTERCONNECTION, PJM COLD SNAP PERFORMANCE DEC. 28, 2017 TO JAN. 7, 2018 13 & fig.10 (Feb. 26, 2018), *available at* <http://www.pjm.com/-/media/library/reports-notice/weather-related/20180226-january-2018-cold-weather-event-report.ashx> (reporting that nuclear and coal generation combined constituted 63% of the online fuel mix during the 2018 cold snap) (“PJM COLD SNAP PERFORMANCE 2018”).

¹⁸ See, e.g., Naureen S. Malik, *Blizzard Triggers 60-Fold Surge in Prices for U.S. Natural Gas*, BLOOMBERG (Jan. 4, 2018), <https://www.bloomberg.com/news/articles/2018-01-04/natural-gas-in-u-s-soars-to-world-s-priciest-as-snow-slams-east>; *Cold Weather, Higher Exports Result in Record Natural Gas Demand*, ENERGY INFO. ADMIN. (“EIA”) (Jan. 5, 2018), <https://www.eia.gov/todayinenergy/detail.php?id=34412> (noting record natural gas demand due in part to recent cold weather); PJM COLD SNAP PERFORMANCE 2018 at 16 (concluding that “[g]as supply issues were the largest” cause of forced outages due to fuel supply issues during the 2018 cold snap, “particularly the weekend of Jan. 6 and Jan. 7, as temperatures reached their lowest points,” and that supply issues “include transportation restrictions and interruptions as well as spot gas commodity availability”).

¹⁹ NAT’L ENERGY TECH. LAB., RELIABILITY, RESILIENCE AND THE ONCOMING WAVE OF RETIRING BASELOAD UNITS VOLUME I: THE CRITICAL ROLE OF THERMAL UNITS DURING EXTREME WEATHER EVENTS 12 (Mar. 13, 2018) (“NETL Report”), *available at* <https://www.netl.doe.gov/research/energy-analysis/search-publications/vuedetails?id=2594>. To the extent necessary, Applicants incorporate the NETL Report by reference as if it were filed in full as an attachment to this Application. The findings in the NETL Report fully support the Secretary determining that an emergency exists within the meaning of FPA Section 202(c) that warrants immediate action.

²⁰ *Id.* at 17 (emphasis added).

²¹ *Id.* at 3.

Overall, DOE estimated that “the value of [coal- and oil-]based power generation resilience” in PJM during this cold weather event was \$3.5 billion.²²

But this is not the first time nuclear and coal-fired generation has saved PJM. In January 2014, a “Polar Vortex” spiked customer demand, dropping system reserves in PJM to just 500 MW (on a demand of over 140,000 MW).²³ PJM calculated that 9,300 MW of generation was unavailable during this event due to interruptions in the natural gas supply to generators.²⁴ While this loss of generating capacity could have been catastrophic, multiple coal-fired generating units slated for retirement were dispatched to meet electric demand²⁵ and nuclear generators also “performed extremely well.”²⁶ “Sixty-five million people within the PJM footprint could have been affected if these traditional baseload units were not available.”²⁷

Combined, the Polar Vortex and this past winter’s extreme cold have shown the value that nuclear and coal-fired generators bring to the electric grid. Just as temperatures plummeted during these periods, the output of nuclear and coal-fired generators spiked. Specifically, during the period December 26, 2017, through January 6, 2018, coal-fired and nuclear generation in PJM averaged output levels of 46,038 MW and 35,485 MW, respectively.²⁸ These levels are over 50 percent greater than the average output of coal-fired generation during the 24 months ending September 2017 (of 29,849 MW) and over 10% greater than the average output of nuclear generation during those 24 months (of 32,167 MW).²⁹ Further, the output levels of coal-fired generators over this 12-day period are well above historical January levels, which tend to see the highest average outputs of such units of any months of the year.³⁰ By any measure, the output of coal-fired and nuclear generating facilities in PJM was exceptional over these recent 12 days.

²² *Id.* at 1, 16.

²³ PJM INTERCONNECTION, ANALYSIS OF OPERATIONAL EVENTS AND MARKET IMPACTS DURING THE JANUARY 2014 COLD WEATHER EVENTS 4 (May 8, 2014), *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>.

²⁴ *Id.* at 26.

²⁵ Secretary NOPR Letter at 3.

²⁶ *See id.* (citing U.S. DEP’T OF ENERGY, STAFF REPORT TO THE SECRETARY ON ELECTRICITY MARKETS AND RELIABILITY 95 (Aug. 2017) (“Staff Report”).)

²⁷ Secretary NOPR Letter at 3.

²⁸ *See Generation by Fuel Type*, PJM INTERCONNECTION, http://dataminer2.pjm.com/feed/gen_by_fuel.

²⁹ *See* PJM INTERCONNECTION, STATE OF THE MARKET REPORTS FOR 2012 THROUGH Q3 2017, http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2018.shtml (as converted from GWh to MW).

³⁰ Specifically, during the three Januarys from 2015 to 2017, coal-fired generation in PJM averaged output of 37,234 MW (and nuclear generation averaged 34,845 MW). *See id.*

The chart below illustrates the spike in nuclear and coal-fired output over this period.³¹ Notably, coal- and oil-fired generation spiked, and nuclear generation rose materially, but gas-fired generation dropped, not only from its average output levels but even from levels seen only a few days prior. As Andrew Ott, PJM's President and CEO, recently testified:

[D]uring this recent cold weather event, obviously more than half of the total supply was coal and nuclear. Certainly, [PJM] couldn't survive without gas; [PJM] couldn't survive without coal; [PJM] couldn't survive without nuclear. [PJM needs] them all in the moment. And I think the key, and what [PJM is] focused on, is each of these bring to the table reliability characteristics. Each of these was online when [PJM] needed them.³²

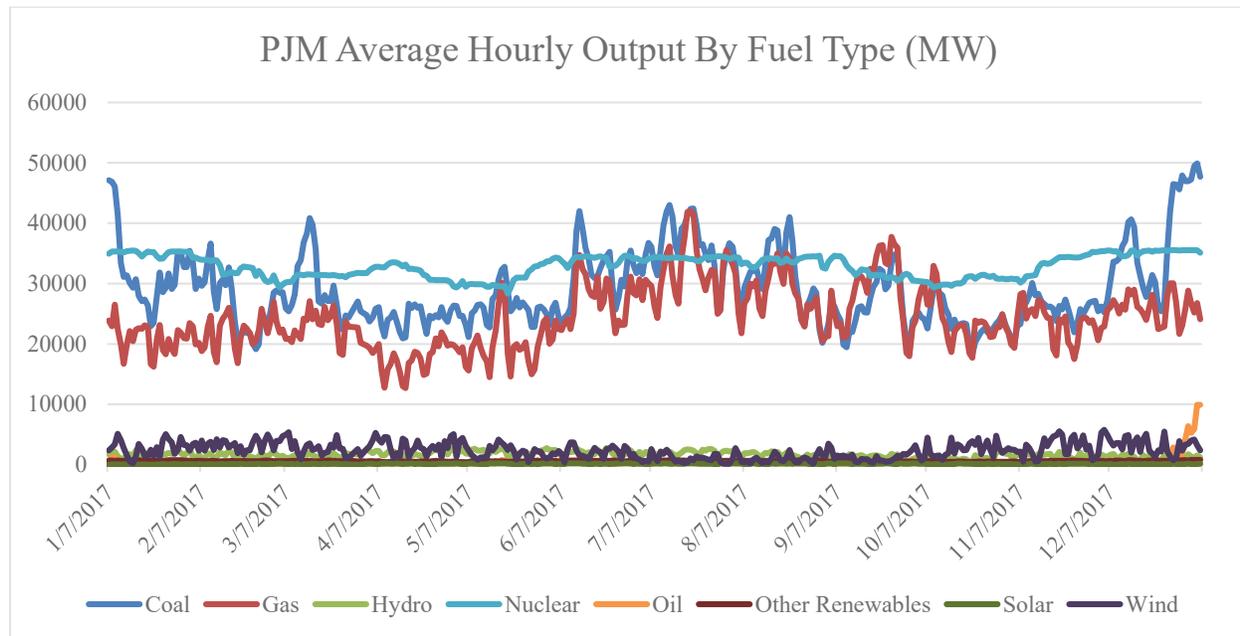
The strong performance of the nuclear and coal-fired units in PJM was a needed counterbalance to the situation for gas-fired units. Specifically, during the cold snap, dramatic price increases were seen in natural gas prices; including for example a spike in PJM at the Texas Eastern M3 interface, in Southeastern Pennsylvania, from a normal level near \$3/MMBtu to \$96/MMBtu.³³ Further, "in eastern PJM . . . gas and electric transmission were severely constrained, leading to . . . elevated natural gas and electricity prices across [the] region."³⁴ The price increases would have been even more dramatic but for the over performance of nuclear and coal-fired units.

³¹ See *Generation by Fuel Type*, PJM INTERCONNECTION, http://dataminer2.pjm.com/feed/gen_by_fuel. This chart excludes March 29, March 30, and April 2, 2017 because no data was reported for those dates.

³² Press Release, Sen. Lisa Murkowski, Hearing Spotlights Importance of Energy Infrastructure, Diverse Fuel Mix (Jan. 23, 2018) (quoting Andrew Ott), <https://www.murkowski.senate.gov/press/release/hearing-spotlights-importance-of-energy-infrastructure-diverse-fuel-mix>.

³³ NETL Report at 14.

³⁴ *Id.* at 6. See also *id.* at 7 (showing a four-fold increase in daily load weighted average marginal electricity price in PJM between December 30, 2017 and January 6, 2018).



But the very same nuclear and coal-fired power plants that allowed PJM to maintain reliability during these extreme weather events are at imminent risk of permanent closure if something is not done *now*. The Energy Information Administration “projects 41 GW of coal and 10 GW of nuclear retirements by 2025,” but, as the NETL Report notes, this projection does not “adequately capture[] the risk” of retirements.³⁵ The report further projects that “as much as 75 GW of coal-fired generation could be retired” by 2025, and notes that another source estimates between “30 and 50 GW of nuclear could face retirement.”³⁶ Without these plants, thousands if not millions of customers could have been without power during sub-zero degree temperatures. And absent immediate and decisive action by DOE, the 11,000 MW of nuclear and coal-fired generation that have kept PJM operating during this period will begin to retire *in the very near future*. As Andrew Ott, PJM’s President and CEO, recently testified, 1,410 MW of nuclear capacity and 3,688 MW of coal-fired capacity that operated during the recent cold snap in the eastern U.S. are scheduled to deactivate within the next five years.³⁷ This testimony is consistent with the NETL Report’s finding that:

The 30 GW of coal that ramped up to meet the surge in PJM load [during the recent cold weather event] clearly includes the units most likely to retire due to insufficient market support, given those units were not running at baseload levels before the event. As more of

³⁵ NETL Report at 25.

³⁶ *Id.* at 30.

³⁷ U.S. Sen. Comm. on Energy and Nat. Res., *The Performance of the Electric Power System in the Northeast and Mid-Atlantic During the Recent Winter Weather Events, Including the Bomb Cyclone*, Questions for the Record Submitted to Mr. Andrew Ott, Response to Question 2 from Sen. Mike Lee (Jan. 23, 2018).

these units retire, the ability of the system to respond to extreme events with reliance, let alone economically, deteriorates.³⁸

Further, it is a matter of public record that FirstEnergy Solutions, which through Applicants indirectly owns 12,300 MW of generation, likely will file for bankruptcy by the end of March 2018.³⁹ Indeed, Charles Jones, CEO of FirstEnergy Corp., recently stated that he would be “shocked” if FirstEnergy Solutions did not file soon.⁴⁰ FirstEnergy Solutions already submitted notice to PJM that it would deactivate its nuclear assets—Davis-Besse and Perry in Ohio and Beaver Valley in Pennsylvania—in 2020 and 2021.

“Distorted price signals” in the organized markets overseen by the Federal Energy Regulatory Commission (“FERC”), such as PJM, “have resulted in under-valuation of grid reliability and resiliency benefits provided by traditional baseload resources, such as [those powered by] coal and nuclear” fuel.⁴¹ As you have recognized, “[b]ecause wholesale pricing in those markets does not adequately consider or accurately value those benefits, generation units that provide the benefits are often not fully compensated for them.”⁴² The NETL Report similarly summarized the problem: “Markets do not currently compensate resilience, and thus that capability is steadily diminishing due to competitive pressures of ongoing, baseload power plant early retirements.”⁴³

This lack of appropriate compensation, among other things, has resulted in the Nation’s nuclear and coal-fired generation closing at an alarming and unprecedented rate. For example “between 2002 and 2016, 531 coal[-fired] generating units representing approximately 59,000 MW of generation capacity retired from the U.S. generation fleet.”⁴⁴ In addition, “[i]t is anticipated that approximately 12,700 MW of coal[-fired generation] will retire through 2020.”⁴⁵ Further, “between 2002 and 2016, 4,666 MW of nuclear generating capacity was announced for

³⁸ NETL Report at 18.

³⁹ Gavin Bade, *FirstEnergy CEO Says Generation Subsidiary Headed for Bankruptcy Protection*, UTILITY DIVE (Feb. 23, 2018), <https://www.utilitydive.com/news/firstenergy-ceo-says-generation-subsidiary-headed-for-bankruptcy-protection/517743/>; Jeffrey Ryser, *FirstEnergy Continues Push Away from Competitive Generation Subsidiary*, PLATTS MEGAWATT DAILY (Feb. 22, 2018).

⁴⁰ Recording of Fourth Quarter 2017 Earnings Webcast, FIRSTENERGY (Feb. 21, 2018), <https://services.choruscall.com/links/fe180221.html> (Mr. Jones stating, at 25:18, “Well, I said in my prepared remarks that I expect that [FES] will be removed from the unregulated money pool between now and the end of March, and that will be the last tie that we have with that business. While I can't speak for FES, I will be shocked if they go beyond the end of March without some type of a filing.”).

⁴¹ Secretary NOPR Letter at 1.

⁴² *Id.* at 3.

⁴³ NETL Report at 3.

⁴⁴ Secretary NOPR Letter at 2 (citing Staff Report at 22).

⁴⁵ *Id.* (citing EIA, *Monthly Update to the Annual Electric Generator Report*, Form EIA-860m (June 2017), <https://www.eia.gov/electricity/data/eia860m/>).

retirement” and “[e]ight reactors representing 7,167 MW of nuclear capacity . . . have announced retirement plans since 2016.”⁴⁶

These retirements must stop immediately in PJM lest the grid be placed at risk of failure through a lack of generation diversity and over-reliance on generating units that lack secure fuel supply and often compete with other industries and customers for limited firm fuel delivery capabilities. As your staff found, “fuel supply chain disruptions can impact many generators during a single widespread fuel shortage event,” but “[n]uclear and coal[-fired power] plants typically have advantages associated with onsite fuel storage. . . .”⁴⁷ Such generating units with on-site storage capacity kept PJM from shedding load during the 2014 Polar Vortex when available generating capacity was only a hair’s width more than demand. And such units have been critical to keeping the grid supplied during the severe cold weather in the East this past winter. But the continued existence of such fuel-secure, baseload units cannot be taken for granted. Unless immediate action is taken, they will continue to retire and PJM and the Nation are likely not to be so lucky as to avoid load-shedding (or worse) the next time generation supply is stretched to its limit.

FERC has for several years failed to heed this warning and to act to prevent this impending crisis. Indeed, FERC has had the opportunity to prevent this crisis on numerous occasions, including the opportunity you provided it through your Notice of Proposed Rulemaking (“NOPR”) issued pursuant to FPA Section 403.⁴⁸ Although you granted FERC’s request to extend the NOPR proceeding, you stated that you would continue to examine “all options within [your] authority under the *Department of Energy Organization Act*, the *Federal Power Act*, and any other authorities to take remedial action as necessary to ensure the security of the nation’s electric grid.”⁴⁹

Despite the fact that the time for such remedial action has come, FERC terminated your rulemaking proceeding and chose instead merely to study the issue further.⁵⁰ And although FERC acknowledged that “resilience remains an important issue that warrants the Commission’s continued attention,”⁵¹ it dismissed evidence establishing the threat to resilience posed by the

⁴⁶ *Id.* at 3 (citing Staff Report at 29-30).

⁴⁷ Staff Report at 91. *See also* NETL Report at 14 (“As for natural gas-fired electricity generation, two significant constraints inhibit its fuel resilience contribution during extreme weather events Most importantly, demand from competing sectors, especially from residential and commercial space heating, takes priority over electricity for natural gas use, limiting and even diminishing the capacity potential for natural gas-based electricity. Compounding this constraint is that of pipeline capacity. Even though abundant natural gas may be available, it must flow through the same limited pipeline capacity already delivering to increased heating demand.”).

⁴⁸ *See generally* Secretary NOPR Letter. *See also* NETL Report at 3 (“The need for reasonable compensation to maintain resilient capacity to endure such periodically-certain threats to the nation formed the basis of [DOE’s] resilience compensation proposal to [FERC].”).

⁴⁹ Secretary Extension Letter at 2 (*italics in original*).

⁵⁰ *Grid Reliability and Resilience Pricing et al.*, 162 FERC ¶ 61,012 (2018).

⁵¹ *Id.* at P 13.

imminent loss of additional nuclear and coal-fired generation and found instead that “the extensive comments submitted by the [regional transmission organizations and independent system operators (“RTOs/ISOs”)] do not point to any past or planned generator retirements that may be a threat to grid resilience.”⁵² Further, FERC concluded that it lacked the legal authority to act on your proposed rule for lack of a showing that current rules were unjust or unreasonable.⁵³

FERC’s response was disappointing. FERC’s reliance on comments by RTOs/ISOs—the very entities that preside over the flawed markets—is misplaced.⁵⁴ More fundamentally, FERC’s decision to study the issue further is too little, too late. As Commissioner Chatterjee noted, “[m]ajor regulatory reform efforts often can take several years to complete.”⁵⁵ The record before FERC, however, demonstrated that the time to act is now. Multiple commenters expect that the trend of premature, economic retirement of nuclear and coal-fired generators will continue if left unaddressed.⁵⁶ Indeed, seven nuclear units (representing 10,500 MW of nameplate capacity) are planning to retire by 2025.⁵⁷ And owners of other nuclear units have stated publicly that they do not intend to invest further in their nuclear units unless and until their host states pass legislation that subsidizes the units.⁵⁸

Even more troubling is that PJM has followed FERC’s lead and decided to kick the can down the road on this critical issue. In its Comments and Responses to FERC’s initiation of a new proceeding on grid resilience, PJM concludes that its bulk electric system “is safe and reliable today—it has been designed and is operated to meet all applicable reliability standards.”⁵⁹ While PJM acknowledged that “generation and other resources” supply essential attributes that support reliability and that “the maintenance or assurance of these attributes into the future are important to resilience mitigation,” PJM has committed to nothing more than further study of the issue.⁶⁰ And PJM’s position is all the more questionable in light of its admission that it does not conduct

⁵² *Id.* at P 15.

⁵³ *Id.* at P 14 (“For the reasons discussed below, the Proposed Rule did not satisfy those clear and fundamental legal requirements under section 206 of the FPA. Given those legal requirements, we have no choice but to terminate Docket No. RM18-1-000.”).

⁵⁴ Among other justifications for taking no action, FERC noted that the RTOs, and the industry more generally, do not have a clear definition or understanding of the resilience issue. *Id.* at P 22. As such, FERC’s decision to take no action was based on incomplete information.

⁵⁵ *Id.* at Chatterjee Concurrence.

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ Public Service Enterprise Group Inc., SEC Form 8-K, at 2 (Feb. 28, 2018).

⁵⁹ PJM Comments at 4.

⁶⁰ *Id.* at 46 (“PJM will need to continue to conduct analysis of the anticipated future availability of these attributes so that it can proactively address the maintenance of these attributes through the markets. PJM will also consider the operational lessons learned from other RTOs in regard to resource mix and essential resource attributes to continue to analyze future trends in resource mix and their impacts on both reliability and resilience.”).

system planning or operations subject to formal resilience criteria, and that it would need additional FERC authorization in order to do so.⁶¹

PJM's conclusion misses the point. As you noted, "urgent action must be taken to ensure the resilience and security of the electric grid."⁶² It is insufficient and wholly illogical to say that action is not needed going forward because PJM meets today's reliability criteria. PJM's comments demonstrate that it has yet to identify and measure resilience, much less taken steps to preserve the resilience of its electric grid.⁶³ Indeed, many of PJM's requests to the Commission do nothing more than pass the buck back to FERC on this critical issue.⁶⁴

Further, PJM's requests for action "to enhance resilience of the grid and interrelated systems"⁶⁵ will not address your concerns regarding the resilience and security of the Nation's electric grid. These requests, which call for additional FERC proceedings and RTO/ISO filings, in some cases require no action by any party for nine to twelve months *after the conclusion of the current FERC proceeding* and will do nothing to stem the tide of premature nuclear and coal-fired plant closures in the interim.⁶⁶ This is particularly alarming because PJM acknowledges that its Capacity Performance changes have failed to produce a long-term solution "to meet the ever-growing demand for gas transportation by the generation sector."⁶⁷ Indeed, natural gas availability

⁶¹ *Id.* at 33-34.

⁶² Secretary Extension Letter at 2.

⁶³ *See, e.g.*, PJM Comments at 37 ("Because PJM does not have formal resilience criteria, PJM adapts existing analyses . . . to derive conclusions about the ability of the PJM BES to withstand a high-impact, low-frequency event, and is working with stakeholders to determine how best to incorporate resilience into PJM's planning process and what criteria should be used."); *id.* at 66 ("RTO wholesale electricity, Ancillary Service markets, capacity markets, and shortage pricing mechanisms were not originally designed specifically with resilience in mind.").

⁶⁴ *See, e.g., id.* at 5 (requesting that FERC "[a]rticulate in this docket that the regional planning responsibilities of RTOs . . . includes an obligation to assess resilience"); *id.* (requesting that FERC "[e]stablish a Commission process . . . that would allow an RTO to receive verification as to the reasonableness of its assessments of vulnerabilities and threats").

⁶⁵ *See* PJM Comments at 5-8.

⁶⁶ *See, e.g., id.* at 6 ("Request that all RTOs . . . submit a subsequent filing . . . to implement resilience planning criteria, and develop processes for the identification of vulnerabilities, threat assessment and mitigation, restoration planning, and related process or procedures needed to advance resilience planning."); *id.* ("Request that all RTOs . . . submit a subsequent filing, including any necessary proposed tariff amendments, for any proposed market reforms and related compensation mechanisms to address resilience concerns within nine to twelve months from the issuance of a Final Order in this docket.").

⁶⁷ *Id.* at 57-58 ("Although PJM was hoping that the Capacity Performance changes would spur a corresponding array of new service offerings by pipelines (and generators seeking such options), at least on the public record such new pipeline services have not been offered as new open season requests [N]ew flexible services, to the extent they have been offered, appear to have been confined to the secondary market in which available gas from LDCs or industrial customers is made available, for a price, on the non-transparent bilateral secondary market. Although this is an effective short term strategy to 'move around' available capacity and take advantage of diversity in demand, it cannot, in the long run, serve as the sole means to meet the ever-growing demand for gas transportation by the generation sector."). PJM's admission that the Capacity Performance program fell short

during the recent cold weather in the eastern U.S. has prompted PJM to consider enacting emergency operational cost procedures for use when emergency conditions affect the grid or gas pipeline system.⁶⁸ PJM's efforts to "to engage interstate pipelines and LDCs to review gas pipeline contingencies"⁶⁹ similarly have failed to produce a long-term solution.

The lack of protection for at-risk nuclear and coal-fired plants during this time actually undermines the effectiveness of other PJM requests. For example, PJM requests that FERC require it to file proposed tariff amendments "to permit non-market operations during emergencies," which "could includ[e] provisions for cost-based compensation when the markets are not operational or when a wholesale supplier is directed to take certain emergency actions by PJM for which there is not an existing compensation mechanism."⁷⁰ FERC's and PJM's inaction, however, has significantly increased the risk that the very plants needed to take these emergency actions will have shuttered by the time PJM files and FERC approves these tariff provisions.

These events demonstrate that, absent immediate intervention by the Secretary, nuclear and coal-fired plants will continue to retire prematurely. In view of this regulatory failure, and as further detailed herein, Applicants seek action from the Secretary to ensure the continued operation of baseload nuclear and coal-fired power plants in PJM. Such immediate action is necessary to address an emergency in the bulk power system overseen by PJM and to serve the public interest by preventing power disruptions and system blackouts. Absent such an order, health care facilities, emergency services, and other critical infrastructure could be without power affecting portions of the 65 million people that reside within the PJM footprint.

contrasts sharply with its prior assurances to FERC that the Capacity Performance program would result in firm fuel supply. PJM Interconnection, L.L.C., Reforms to the Reliability Pricing Market ("RPM") and Related Rules in the PJM Open Access Transmission Tariff ("Tariff") and Reliability Assurance Agreement Among Load Serving Entities ("RAA") at 53, FERC Docket No. ER15-623-000 (Dec. 12, 2014) ("Capacity Market Sellers that now will face more harsh financial consequences for a failure to perform during emergencies (with no limit on when such emergencies arise) will likely need to invest in plant design changes or new equipment, or increase operating budgets to accommodate more staff, firm fuel delivery arrangements, greater inventories, or changed operating practices.").

⁶⁸ Jared Anderson, *PJM Mulls Emergency Operational Cost Issues*, PLATTS MEGAWATT DAILY (Jan. 10, 2018).

⁶⁹ PJM COLD SNAP PERFORMANCE 2018 at 21-22.

⁷⁰ PJM Comments at 6.

II. APPLICATION FOR EMERGENCY ORDER

In the United States, RTOs work to ensure the operation and security of the bulk electric power system. PJM operates the electric grid and centralized electricity markets in all or part of 13 different states and the District of Columbia,⁷¹ overseeing over 178,000 MW of installed capacity and serving approximately 65 million people.⁷² Over half of PJM's generating capacity is nuclear and coal-fired generation,⁷³ and nearly one-quarter of the Nation's nuclear and coal-fired generating capacity is located within PJM.⁷⁴

PJM's power markets, however, consistently fail to compensate nuclear and coal-fired generators for the full value of the benefits that they provide, such as fuel security and diversity. As stated by a former Commissioner of FERC, "I believe that fuel diversity is really key in ensuring reliability going forward, even in these dynamic times [I]t is imperative that we protect fuel diversity."⁷⁵ Such continued fuel diversity in PJM, however, is at risk.

PJM's independent market monitor recently found that between six and nine nuclear plants, with a total capacity of 7,058 MW to 14,027 MW, did not recover their avoidable costs—the costs to keep the generators operating—in two of the last three years.⁷⁶ Additionally, four nuclear plants, with capacity of 3,554 MW, are not expected to recover their annual avoidable costs on average from 2018 through 2020.⁷⁷ The market monitor similarly found that a "significant number of coal units are at risk of retirement" because 17,302 MW of coal-fired capacity is expected to receive less than 90 percent of its avoidable costs.⁷⁸ Overall, the market monitor found that, in addition to units currently planning to retire, between 22,929 MW and 30,785 MW of capacity in PJM,

⁷¹ PJM's territory includes all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. *Who We Are*, PJM, <http://www.pjm.com/about-pjm/who-we-are.aspx> (last visited Mar. 22, 2018); *PJM's Mission & Vision*, PJM, <http://www.pjm.com/about-pjm/who-we-are/mission-vision.aspx> (last visited Mar. 22, 2018).

⁷² *Capacity by Fuel Type*, PJM (June 1, 2017), <http://www.pjm.com/-/media/markets-ops/ops-analysis/capacity-by-fuel-type-2017.ashx?la=en>; *Who We Are*, PJM, <http://www.pjm.com/about-pjm/who-we-are.aspx> (last visited Mar. 22, 2018).

⁷³ *Capacity by Fuel Type*, PJM (June 1, 2017) (showing nuclear and coal-fired generation represent 19% and 33% of PJM's installed generation capacity, respectively).

⁷⁴ *Compare id.* (showing that nuclear and coal-fired generation represent 33,992 MW and 59,835 MW of PJM's installed generation capacity, respectively), with *Preliminary Monthly Generator Inventory*, EIA (June 2017), <https://www.eia.gov/electricity/data/eia860m/> (showing, when filtered by "Technology," 284,439 MW of conventional steam coal generator nameplate capacity and 104,628 MW of nuclear generator nameplate capacity as of June 2017 nationwide).

⁷⁵ *Oversight of the Federal Energy Regulatory Commission: Hearing Before the Subcomm. on Energy and Power*, 114th Cong., Prelim. H'rg Tr. at 54 (2015) (testimony of Colette D. Honorable, Commissioner, FERC).

⁷⁶ 2017 PJM Report at 2.

⁷⁷ *Id.*

⁷⁸ *Id.*

primarily from nuclear and coal-fired generation, is at risk of retirement.⁷⁹ In fact, the market monitor found that over 90 percent of the “at-risk” generation in PJM was either nuclear or coal-fired.⁸⁰ But new nuclear and coal-fired generation will not replace this lost capacity because, as the market monitor found, “[i]n 2017 . . . a new coal plant and a new nuclear plant would have been significantly unprofitable.”⁸¹

By contrast, nearly all oil, natural gas, hydroelectric, and pumped storage generators recovered fully their avoidable costs in 2017.⁸² This marked difference is a result of the fact that nuclear and coal-fired units are baseload plants. As such, they are designed to run “24/7” on a consistent basis with 25 days of on-site fuel availability (when running “full bore”), making them the backbone of the electric system.⁸³ PJM’s energy market, though, is designed not to consider or incentivize operational diversity, fuel security, or system resiliency. Rather, it dispatches generation units based only on short-term marginal price without regard for the fixed costs of the facility, or the firmness of its fuel supply or transportation. Specifically, PJM uses a reliability-constrained least-cost model to dispatch the lowest-cost units required to satisfy electricity demand.⁸⁴ But because nuclear and coal-fired units are designed to run continuously, they often continue to operate through lower-priced periods—such as the middle of the night—sometimes requiring them to sell their electricity output at a loss. This is particularly true in states with large amounts of wind-powered generation, as wind tends to generate at its peak overnight when electricity demand is low.⁸⁵ The unavoidable requirement to operate during lower-priced periods places significant financial strain on baseload units such as nuclear and coal-fired generators that are not properly compensated in the existing markets.⁸⁶ All indications are that these trends will continue.

⁷⁹ *Id.*

⁸⁰ *Id.* at tbl.7-36.

⁸¹ *Id.* at 6.

⁸² *Id.* at tbl.7-30.

⁸³ See N. AM. ELEC. RELIABILITY CORP., POLAR VORTEX REVIEW 36-37 (Sept. 2014), http://www.nerc.com/pa/trm/January%202014%20Polar%20Vortex%20Review/Polar_Vortex_Review_29_Sep_t_2014_Final.pdf (“[A] growing dependence on gas-fired generation can increase the [bulk power system’s] exposure to disruptions from insufficient fuel supply, transportation, and delivery. . . . Unlike coal and fuel oil, natural gas is not easily stored on site.”). Cf. PJM INTERCONNECTION, PJM’S EVOLVING RESOURCE MIX AND SYSTEM RELIABILITY 35 (Mar. 30, 2017) (“[R]ecent studies, including the Black Sky/Black Start Protection Initiative, suggest that 30 days of fuel inventory would be required to adequately respond to Black Sky type events.”).

⁸⁴ See *Market for Electricity*, PJM, <http://learn.pjm.com/electricity-basics/market-for-electricity.aspx> (last visited Mar. 22, 2018).

⁸⁵ See, e.g., Scott DiSavino, *Texas Power Demand to Hit 2016 Peak Amid Heat Wave: ERCOT*, REUTERS (Aug. 4, 2016), <http://www.reuters.com/article/us-usa-texas-power-heatwave-idUSKCN10F202> (noting that wind generation in ERCOT “typically produce[s] most energy overnight”).

⁸⁶ Markets only provide signals that lead to efficient decisions on the part of market participants if the markets “efficiently price all valuable services provided to the system.” FirstEnergy Reply Comments, Ex. 1 (“Hunger Reply Aff.”) at 9, *Grid Resiliency Pricing Rule*, FERC Docket No. RM18-1-000 (Nov. 7, 2017).

PJM’s market monitor cursorily dismissed this undeniable trend of nuclear and coal-fired generation retirements because of under-recovery, stating that “[m]any generating plants have retired in PJM since the introduction of markets and many generating plants have been built since the introduction of markets” and that “[t]he fact that some plants are uneconomic does not call into question the fundamentals of PJM markets.”⁸⁷ This response is alarming to say the least. Nuclear and coal-fired generation provides substantial resilience and security benefits to the electric grid and to the Nation. Indeed, as the market monitor itself recognized, “[s]ignificant reliance on specific fuels, including nuclear, coal and gas means that markets are at risk from a significant disruption in any one fuel.”⁸⁸ By treating the lost nuclear and coal-fired capacity the same as the non-nuclear and non-coal-fired capacity that has replaced it, the market monitor ignores the significant threat to the electric grid and the Nation’s security posed by the loss of resilient, fuel-secure baseload generation.

As explained below, Applicants request that DOE determine that an emergency exists in PJM within the meaning of FPA Section 202(c) with respect to a threat to energy security and reliability, and thus direct the subject baseload nuclear and coal-fired generators to enter into contracts and all necessary arrangements with PJM, on a plant-by-plant basis, to generate, deliver, interchange, and transmit electric energy, capacity, and ancillary services to maintain fuel diversity and grid dependability and resiliency within the PJM region.

A. The Secretary’s Authority Under Section 202(c) of the Federal Power Act

Section 202(c) of the Federal Power Act grants the Secretary the authority to determine “that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy,”⁸⁹ and, once such a determination is made, “to require by order such temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in [his] judgment will best meet the emergency and serve the public interest.”⁹⁰

The Secretary’s authority and discretion under Section 202(c) is quite broad and is not limited to emergencies caused by war or limited in duration. Section 202(c) states that it may be invoked during times of war or during emergencies, and empowers the Secretary “whenever [he] determines that an emergency exists by reason of” certain specified market conditions “or other causes” to order actions “as in [his] judgment will best meet the emergency and serve the public interest.”⁹¹

⁸⁷ 2017 PJM Report at 2.

⁸⁸ *Id.* at 5.

⁸⁹ 16 U.S.C. § 824a(c)(1).

⁹⁰ *Id.*

⁹¹ *Id.* The legislative history of Section 202(c) confirms this interpretation, explaining that in crisis conditions DOE should be “ready to do all that can be done in order to prevent a break-down in electric supply.” S. Rep. No. 74-621, at 49.

DOE's regulations define emergency broadly, stating that an emergency "can result from a sudden increase in customer demand, an inability to obtain adequate amounts of the necessary fuels to generate electricity, or a regulatory action which prohibits the use of certain electric power supply facilities."⁹² In addition, the regulation also states that "[e]xtended periods of insufficient power supply as a result of inadequate planning or the failure to construct necessary facilities can result in an emergency"⁹³

The current situation in PJM constitutes such an emergency.

B. An Emergency Exists Due to the Recent and Imminent Critical Reduction in Nuclear and Coal-Fired Generation Capacity

The Nation's bulk electric system is undergoing rapid change. As the DOE recently recognized, the provision of electricity provides various benefits that are not recognized or compensated by the markets created by these politically driven actions:

Society places value on attributes of electricity provision beyond those compensated by the current design of the wholesale market.

- Americans and their elected representatives value the various benefits specific power plants offer, such as jobs, community economic development, low emissions, local tax payments, resilience, energy security, or the national security benefits associated with a nuclear industrial base. Most of these benefits are not recognized or compensated by wholesale electricity markets.⁹⁴

Indeed, the DOE's January 2017 Quadrennial Energy Review states that "[s]hort-run markets may not provide adequate price signals to ensure long-term investments in appropriately configured capacity" and "resource valuations tend not to incorporate superordinate network and/or social values such as enhancing resilience into resource or wires into investment decision making."⁹⁵ IHS Energy has found that, as a result of this "missing money" problem, "the loss of

⁹² 10 C.F.R. § 205.371.

⁹³ *Id.*

⁹⁴ Staff Report at 11.

⁹⁵ U.S. DEP'T OF ENERGY, TRANSFORMING THE NATION'S ELECTRICITY SYSTEM: THE SECOND INSTALLMENT OF THE QUADRENNIAL ENERGY REVIEW 4-41 (January 6, 2017), *available at* <https://www.energy.gov/sites/prod/files/2017/02/f34/Quadrennial%20Energy%20Review--Second%20Installment%20%28Full%20Report%29.pdf>.

power supply diversity is accelerating because too many power plants are retiring before it is economic to do so.”⁹⁶

This market failure is reaching a crisis point. Dr. David Hunger, a former FERC Staff member and Vice President within the Energy Practice of Charles River Associates, found that “there were more [generator] retirements in the seven-year period from 2010 to 2016 (457 units) than in the 20-year period from 1990 to 2009 (358 units). Likewise, the quantity of nuclear and coal-fired generation capacity retired in 2010-2016 (68,540 MW nameplate) was more than double that in the prior 20 years, 1990-2009 (26,721 MW nameplate).”⁹⁷ As the DOE concluded, “[g]enerator profitability could become a public policy concern if so much generation is financially challenged that the reliability or resilience of the [bulk power system] become threatened.”⁹⁸ The rash of nuclear and coal-fired generator closings and other recent events in PJM are evidence that it already is a public policy concern. But these are not the only warning signs.

January 2014 Polar Vortex in PJM: A severe cold snap spiked customer demand, dropping system reserves in PJM to just 500 MW (on a demand of over 140,000 MW).⁹⁹ PJM calculated that 9,300 MW of generation was unavailable during this event due to interruptions in the natural gas supply to generators.¹⁰⁰ While this loss of generating capacity could have been catastrophic, multiple coal-fired generating units slated for retirement were dispatched to meet electric demand¹⁰¹ and nuclear generators also “performed extremely well.”¹⁰² “Sixty-five million people within the PJM footprint could have been affected if these traditional baseload units were not available.”¹⁰³

Extreme Cold in December 2017 and January 2018: From December 27, 2017, to January 8, 2018, the eastern U.S. saw extremely cold temperatures and spiking electric demand, which again illustrate how such weather impacts natural gas supply to electric generating units. Nuclear

⁹⁶ IHS ENERGY, THE VALUE OF US POWER SUPPLY DIVERSITY 7 (July 2014), available at <https://www.nei.org/CorporateSite/media/filefolder/Backgrounders/Reports-Studies/IHS-Fuel-Diversity-Study-18-July-2014.pdf?ext=.pdf>.

⁹⁷ FirstEnergy Comments, Ex. 4 (“Hunger Aff.”) at 22, *Grid Resiliency Pricing Rule*, FERC Docket No. RM18-1-000 (Oct. 23, 2017).

⁹⁸ Staff Report at 118. NERC has also classified the changing resource mix as a “high risk” issue for the electric grid. See N. AM. ELEC. RELIABILITY CORP., STATE OF RELIABILITY 2017 7 (June 2017), available at https://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/SOR_2017_MASTER_20170613.pdf.

⁹⁹ PJM INTERCONNECTION, ANALYSIS OF OPERATIONAL EVENTS AND MKT. IMPACTS DURING THE JAN. 2014 COLD WEATHER EVENTS 4 (May 8, 2014), <http://www.pjm.com/~media/library/reports-notice/weather-related/20140509-analysis-of-operational-events-and-market-impacts-during-the-jan-2014-cold-weather-events.ashx>.

¹⁰⁰ *Id.* at 26.

¹⁰¹ Secretary NOPR Letter at 3.

¹⁰² Staff Report at 95.

¹⁰³ Secretary NOPR Letter at 3.

and coal-fired plants out-performed natural gas plants during this period by a significant margin.¹⁰⁴ For example, on the morning of Friday, January 5, 2018, nuclear and coal-fired generators were running at 135% and 111% of their committed capacity in PJM's 2017-2018 capacity auction, whereas natural gas plants were running at merely 45% of their committed capacity.¹⁰⁵ In fact, while over 64,000 MW of gas-fired generation cleared in the 2017-2018 capacity auction, only approximately 29,000 MW were running that morning.¹⁰⁶ As the recent NETL Report on the cold weather event concluded, demand in PJM "could not have been met without coal."¹⁰⁷ These facts are quite telling, as much of this difference can be attributed to natural gas price spikes and supply interruptions.¹⁰⁸ While the PJM grid has not experienced load-shedding, thanks to lower electric demand over the holiday season and the performance of nuclear and coal-fired generators, this may not be the case during future extreme weather events if the trend of nuclear and coal-fired plant closures continues.¹⁰⁹

¹⁰⁴ See PJM COLD SNAP PERFORMANCE 2018 at 13 & fig.10 (showing that nuclear and coal-fired generation combined constituted 63% of the online fuel mix during the 2018 cold snap, while natural gas-fired generation constituted 22%).

¹⁰⁵ See *Data Miner 2*, PJM, <http://www.pjm.com/markets-and-operations/etools/data-miner-2.aspx> (when filtered to Generation by Fuel Type for 8 a.m. on January 5, 2018, showing nuclear and coal-fired output of 35,543 MW and 50,254.8 MW, respectively); *Commitments by Fuel Type & Delivery Year 2007/08 - 2019/20*, PJM, <http://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/rpm-commitment-by-fuel-type-by-dy.ashx?la=en> (last visited Mar. 22, 2018) (showing cleared UCAP for 2017-2018 planning year of 26,401 MW for nuclear generation and 45,354 MW for coal-fired generation).

¹⁰⁶ See *Data Miner 2*, PJM, <http://www.pjm.com/markets-and-operations/etools/data-miner-2.aspx>, (when filtered to Generation by Fuel Type for 8 a.m. on January 5, 2018, showing gas output of 28,624.3 MW); *Commitments by Fuel Type & Delivery Year 2007/08 - 2019/20*, PJM, <http://www.pjm.com/-/media/markets-ops/rpm/rpm-auction-info/rpm-commitment-by-fuel-type-by-dy.ashx?la=en> (last visited Mar. 22, 2018) (showing cleared UCAP for 2017-2018 planning year of 64,089 MW for gas-fired generation); see also PJM COLD SNAP PERFORMANCE 2018 at fig.11.

¹⁰⁷ NETL Report at 17.

¹⁰⁸ Operational flow orders (restrictions/limitations placed on gas consumption by pipeline operators) have been in place on numerous natural gas pipelines throughout PJM since late December 2017, including Transco, Texas Eastern, Dominion, and Columbia. See Transco Pipeline, *Critical Notices*, <http://www.1line.williams.com/Transco/index.html> (last visited Mar. 22, 2018); Texas Eastern, *Critical Notices*, <https://infopost.spectraenergy.com/infopost/> (last visited Mar. 22, 2018); Dominion, *Critical Notices*, http://dekaflow.dominionenergy.com/jsp/info_post.jsp?&company=dti (last visited Mar. 22, 2018); Columbia Gas Transmission, *Critical Notices*, <http://www.columbiapipeline.com/cpginfopost/> (last visited Mar. 22, 2018). See also NETL Report at 14 ("[N]atural gas in PJM spiked from a normal level near \$3/MMBtu to \$96/MMBtu at the Texas Eastern M3 interface, in Southeastern PA, at the [bomb cyclone] peak on January 5.").

¹⁰⁹ NETL Report at 18 ("To maintain the resilience seen in this event, any retiring units that were dispatched during the event would have to be replaced with other resilient generation sources and their associated infrastructure (e.g. pipelines, transmission). Due to the timeframe required for permitting, development, and construction, these projects must be well underway prior to potential unit retirements to ensure their availability.").

June 2017 Yorktown Un-Retirement: The Department of Energy issued a Section 202(c) order to force Dominion Energy to keep its Yorktown coal-fired units in PJM online to address future reliability needs.¹¹⁰

System Design Changes: The bulk power system is undergoing a rapid transformation and the impacts of this change are not being fully studied or understood. The system is moving from one that was driven by sound engineering practices and multiple redundancies to a system using an economic model with no consideration for system needs. The North American Electric Reliability Corporation (“NERC”) has noted that the “changing resource mix is altering the operating characteristics of the bulk power system.”¹¹¹ NERC warned that these changes must be “properly managed in order to assure continued reliability and ensure resiliency.”¹¹²

Pipeline Vulnerabilities: A report published by Quanta Technology noted high levels of vulnerability in PJM from a shortfall of pipeline capacity supplying the Atlantic coast, a shortfall of pipeline capacity to access storage and production, disruptions in supply or storage during winter peak season, and a lack of firm gas supply contracts.¹¹³

Future Price Volatility: A recent report by IHS Energy states that the current diversified portfolio of the U.S. power supply lowers the cost of generating electricity by more than \$93 billion per year compared to a less diverse case with no meaningful contributions from nuclear and coal-fired generation.¹¹⁴ As such key baseload plants continue to retire, price volatility is expected to rise as the system becomes more reliant on a single fuel source.¹¹⁵ Dr. Hunger similarly concluded that, “[w]hen resources retire, [market] prices can fluctuate in an unpredictable manner.”¹¹⁶

Baseload Plant Closures: In the past four years, over 11,000 MW of coal-fired generation has closed in PJM, the equivalent of a dozen large power plants.¹¹⁷ Many of these plants were

¹¹⁰ Order No. 202-17-2 (Dep’t of Energy June 16, 2017), *reh’g dismissed sub nom.* Order No. 202-17-5 (Sep. 15, 2017). *See also* Order No. 202-17-4 (Dep’t of Energy Sep. 14, 2017) (renewing initial order), *reh’g dismissed sub nom.* Order No. 202-18-1 (Nov. 6, 2017); Order No. 202-18-2 (Dep’t of Energy Dec. 13, 2017) (further renewing order).

¹¹¹ Letter from Gerry Cauley, President and CEO, NERC, to Rick Perry, U.S. Sec’y of Energy, Attachment (“Synopsis of NERC Reliability Assessments”) at 1 (May 9, 2017), *available at* <https://www.nerc.com/news/Headlines%20DL/DOE%20Grid%20Study%20Comments%2012OCT17.pdf>.

¹¹² *Id.*

¹¹³ HENRY CHAO, COMMENTS OF QUANTA TECHNOLOGY ON PJM’S EVOLVING RESOURCE MIX AND SYSTEM RELIABILITY 11 (May 17, 2017), *available at* http://quanta-technology.com/sites/default/files/QuantaTechnology_Comments_on_PJM%20Whitepaper.pdf.

¹¹⁴ IHS ENERGY, THE VALUE OF US POWER SUPPLY DIVERSITY at 5.

¹¹⁵ *See id.* at 9-10.

¹¹⁶ Hunger Aff. at 33.

¹¹⁷ 2017 PJM Report at 544 tbl.12-5 (listing coal unit retirements of 2,239 MW, 7,064.8 MW, 243 MW, and 2,038 MW in 2014, 2015, 2016, and 2017, respectively).

operating during the 2014 Polar Vortex and are no longer available to run in the event of system stress.

Problems Associated with Location of Replacement Resources: Generation resources used to replace retiring plants are frequently located far away from the location of the retiring generation, which poses multiple problems. First, as Dr. Hunger states, this “may cause temporary or persistent congestion, increasing uncertainty related to locational pricing, a primary signal against which generation investment or retirement decisions need to be made.”¹¹⁸ Second, significant new transmission infrastructure may need to be constructed. For example, approximately \$1 billion of new transmission infrastructure was needed to maintain reliability after closure of certain generating units in northern Ohio in 2014 and 2015.¹¹⁹

Additional Plant Closures: Numerous baseload plants in PJM have announced that they are financially challenged and are closing or contemplating closure. If action is not taken, thousands of additional megawatts of reliable baseload power will retire in the next several years, leaving PJM without fuel-secure baseload resources.¹²⁰

- It is a matter of public record that FirstEnergy Solutions, which through Applicants indirectly owns 12,300 MW of generation, likely will file for bankruptcy by the end of March 2018.¹²¹ Multiple plants are at risk for permanent closure as a result of this expected action.
 - FirstEnergy Solutions submitted notices to PJM on March 28, 2018, that it would deactivate its three nuclear plants, Davis-Besse (908 MW), Perry (1,268 MW), and Beaver Valley (1,872 MW), by 2021.

¹¹⁸ Hunger Aff. at 33.

¹¹⁹ Direct Testimony of Gavin Cunningham at 3, Application of Ohio Edison et al., Pub. Util. Comm’n of Ohio No. 14-1297-EL-SSO (Aug. 4, 2014).

¹²⁰ In addition to the closures listed, Dominion submitted deactivation requests in January 2018 for four coal-fired units with capacity totaling approximately 400 MW. PJM FUTURE DEACTIVATIONS (Dec. 29, 2017), <http://www.pjm.com/-/media/planning/gen-retire/pending-deactivation-requests.ashx?la=en> (“PJM FUTURE DEACTIVATIONS”). These units were placed in “cold reserve”—meaning they could be restarted if necessary—based on a number of factors including the cost of solar and wind generation and the abundance of natural gas. Sarah Rankin, *Dominion to Eliminate Nearly 400 Positions After Review of Power Generation Group*, RICHMOND TIMES-DISPATCH (Jan. 17, 2018), http://www.richmond.com/news/virginia/dominion-to-eliminate-nearly-positions-after-review-of-power-generation/article_60633a02-01d5-50a8-bcfc-f2ccf04b8fb5.html.

¹²¹ Gavin Bade, *FirstEnergy CEO Says Generation Subsidiary Headed for Bankruptcy Protection*, UTILITY DIVE (Feb. 23, 2018), <https://www.utilitydive.com/news/firstenergy-ceo-says-generation-subsidiary-headed-for-bankruptcy-protection/517743/>; Jeffrey Ryser, *FirstEnergy continues Push Away from Competitive Generation Subsidiary*, PLATTS MEGAWATT DAILY (Feb. 22, 2018).

- FirstEnergy Corp. announced that Units 5–7 at the W.H. Sammis coal-fired plant (1,490 MW) are in danger of being closed. The company previously announced that Units 1–4 (720 MW) will close by May 2020.¹²²
- FirstEnergy Corp. has announced that the 2,510 MW Bruce Mansfield coal-fired plant is at risk of closure due to the exposure to changing market conditions.¹²³
- Allegheny Energy Supply Company, LLC, a FirstEnergy Corp. subsidiary, recently submitted a deactivation notice for Pleasants Power Station, a 1,300 MW coal-fired plant in West Virginia.¹²⁴
- Dayton Power & Light has announced the closure by June 2018 of the J.M. Stuart coal-fired plant (2,318 MW) and the Killen Station Unit 2 coal-fired plant (600 MW), citing market conditions making the plants not economically viable.¹²⁵ Stuart Unit 1 was closed even earlier, on September 30, 2017.¹²⁶
- Owners of the 1,884 MW Homer City coal-fired power plant attempted to sell the plant in 2016, but were unable to find a buyer; Standard & Poor’s analysts cite lower power prices and increasing expenses as driving forces behind the facility’s ills.¹²⁷
- Westmoreland Partners recently announced the sale or closure of the 209 MW Roanoke Valley coal-fired power plant.¹²⁸ As anticipated, on March 1, 2017, these units retired.¹²⁹

¹²² *FirstEnergy to Deactivate Units at Two Ohio Power Plants*, FIRSTENERGY (July 22, 2016), https://www.firstenergycorp.com/content/fecorp/newsroom/news_articles/firstenergy-to-deactivate-units-at-two-ohio-power-plants-.html; PJM FUTURE DEACTIVATIONS.

¹²³ Tom Henry, *FirstEnergy Exec Calls for ‘Urgent’ Aid*, TOLEDO BLADE (Mar. 25, 2017), <http://www.toledoblade.com/Energy/2017/03/25/FirstEnergy-exec-calls-for-urgent-aid.html>.

¹²⁴ *Id.* In addition, during the first quarter of 2018, FirstEnergy Corp. took a \$120 million pre-tax impairment charge on the value of the Pleasants Power Station. FirstEnergy Corp., Annual Report (Form 10-K) at 4 (Feb. 20, 2018).

¹²⁵ See Wendy Mitchell, *DP&L Determined to Close J.M. Stuart and Killen Power Plants*, THE LEDGER INDEP. (Mar. 20, 2017), http://www.maysville-online.com/news/local/dp-l-determined-to-close-j-m-stuart-and-killen/article_99f244ef-b832-5477-aa8b-831b8fc796be.html; PJM, FUTURE DEACTIVATIONS.

¹²⁶ *PJM Generator Deactivations*, PJM (Dec. 18, 2017), <http://www.pjm.com/-/media/planning/generator-deactivations.ashx?la=en> (“PJM DEACTIVATIONS”).

¹²⁷ Anya Litvak, *Homer City Gets Bids But No Deals*, PITTSBURGH POST-GAZETTE (Sept. 14, 2016), <http://powersource.post-gazette.com/powersource/companies/2016/09/14/Homer-City-gets-some-bids-but-no-deals/stories/201609110096>.

¹²⁸ John Dixon, *Weldon Power Plant Closing*, THE DAILY HERALD (Roanoke) (Mar. 10, 2017), http://www.rrdailyherald.com/news/local/weldon-power-plant-closing/article_6a9f1208-0511-11e7-a204-b762cd148f4a.html.

¹²⁹ PJM DEACTIVATIONS.

- Exelon has announced that it will close the Oyster Creek nuclear plant (608 MW) in October 2018—a decade before the end of its operating license—citing negative economic factors.¹³⁰
- Exelon has announced the premature closure of the 837 MW Three Mile Island nuclear power plant in September 2019, citing deteriorating economic value.¹³¹

C. The Emergency in Nuclear and Coal-Fired Generation Threatens Generation Diversity, Resiliency, Dependability, and Electric Security in PJM

A recent PJM report noted that the system was able to maintain operational reliability with a system comprised of 86 percent natural gas-fired generation, however the report did not fully capture risks associated with gas deliverability.¹³² PJM itself admits to this issue, stating, “We found that the risk to the system wasn’t that resources couldn’t necessarily provide reliability attributes but that *the potential concentration of a single fuel source or low-probability, high-impact events could cause significant impacts to the system.*”¹³³

Without baseload nuclear and coal-fired generation, the United States is taking the most sophisticated and redundant bulk electric system in the world and putting it on top of an unsophisticated bulk gas system that lacks the same level of redundancy, creating additional security risks. An electric system that is not resilient to high-impact events is not a reliable system, and is one that threatens the national security of the United States. In short, the continued retirement of nuclear and coal-fired generating facilities in PJM has resulted in an emergency situation that has placed the continuing security of PJM at risk. As you noted in your September 28, 2017 letter to FERC, “the resiliency of the electric grid is threatened by the premature retirement of these fuel-secure traditional baseload resources.”¹³⁴

¹³⁰ See Press Release, Exelon, Exelon to Retire Oyster Creek Generating Station in 2019 (Dec. 8, 2010), http://www.exeloncorp.com/newsroom/Pages/pr_20101208_Nuclear_OysterCreekRetirement.aspx; Robert Walton, *Exelon to Close Oyster Creek Nuke in October, a Year Early*, UTILITY DIVE (Feb. 2, 2018), <https://www.utilitydive.com/news/exelon-to-close-oyster-creek-uke-in-october-a-year-early/516236/>; PJM FUTURE DEACTIVATIONS.

¹³¹ See Press Release, Exelon, Exelon to Retire Three Mile Island Generating Station in 2019 (May 30, 2017), <http://www.exeloncorp.com/newsroom/exelon-to-retire-three-mile-island-generating-station-in-2019>; PJM FUTURE DEACTIVATIONS.

¹³² PJM INTERCONNECTION, PJM’S EVOLVING RESOURCE MIX AND SYSTEM RELIABILITY 5 (Mar. 30, 2017) (“[A]dditional risks, such as gas deliverability during polar vortex-type conditions and uncertainties associated with economics and public policy, were not fully captured in this analysis.”), <http://www.pjm.com/~media/library/reports-notice/special-reports/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx>.

¹³³ Press Release, PJM, PJM Study: System Reliable Even with Much More Gas, Renewables; Resilience Key to Operational Reliability (Mar. 30, 2017) (emphasis added) (quoting Michael Bryson, PJM Vice President of Operations), <http://www.pjm.com/~media/about-pjm/newsroom/2017-releases/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx>.

¹³⁴ Secretary NOPR Letter at 1.

PJM itself has recognized the need for resiliency, finding that, “[i]n addition to delivering energy services reliably during strained system conditions, to which probabilities can be attached (e.g., plant outages, weather variability), a resilient energy system also must be resistant to larger scale shocks to which it is difficult to attach probabilities”¹³⁵ PJM recently concluded that “reliability attributes supplied through generation and other resources . . . support reliability” and “the maintenance or assurance of these attributes into the future are important to resilience mitigation.”¹³⁶ Fuel diversity and security are key components of a resilient grid. PJM acknowledged the connection between diversity and resiliency when it committed to “analyz[ing] future trends in resource mix and their impacts on both reliability and resilience.”¹³⁷ As PJM’s market monitor stated, “[s]ignificant reliance on specific fuels, including nuclear, coal and gas means that markets are at risk from a significant disruption in any one fuel.”¹³⁸

NERC goes further, recognizing not only the importance of fuel diversity in maintaining a resilient energy system,¹³⁹ but also the critical contributions of nuclear and coal-fired resources to mitigating risks to the electric grid.¹⁴⁰ Overreliance on natural gas, by contrast, *increases* risk to the electric grid because, as NERC states, “within a relatively short time, a major failure” in the natural gas transmission system “could result in a loss of electric generating capacity that could exceed the electric reserves available to compensate for these losses.”¹⁴¹ As explained by Dr. Henry Chao, Executive Advisor and Vice President at Quanta Technology and former Vice President at New York Independent System Operator (“NYISO”): “Abundant supplies of natural gas provide many advantages to electric consumers, but . . . natural gas delivery systems lack the reliability and redundancy of the bulk electric system. Specifically, there are no systematic reliability criteria for natural gas delivery system planning and operations; whereas the electric power industry has mandatory reliability standards that are developed and enforced by NERC.”¹⁴²

¹³⁵ PJM INTERCONNECTION, PJM’S EVOLVING RESOURCE MIX AND SYSTEM RELIABILITY 33 (Mar. 30, 2017).

¹³⁶ PJM Comments at 46.

¹³⁷ *Id.*

¹³⁸ 2017 PJM Report at 5.

¹³⁹ N. AM. ELEC. RELIABILITY CORP., SYNOPSIS OF NERC RELIABILITY ASSESSMENTS: THE CHANGING RES. MIX AND THE IMPACTS OF CONVENTIONAL GENERATION RETIREMENTS 4 (May 9, 2017) (“Fuel diversity provides a fundamental benefit of increased resilience. . . . Areas with limited fuel and/or limited resource diversity may be challenged and should increase their attention to resiliency planning . . .”).

¹⁴⁰ *Id.* (“Coal and nuclear resources, by design, are designed for low cost O&M and continuous operation. However, it is not the economics nor the fuel type that make these resources attractive from a reliability perspective. Rather, these conventional steam-driven generation resources have low forced and maintenance outage hours traditionally and have low exposure to fuel supply chain issues.”); *id.* at 2 (“Coal-fired and nuclear generation have the added benefits of high availability rates, low forced outages, and secured on-site fuel. Many months of on-site fuel allow these units to operate in a manner independent of supply chain disruptions.”).

¹⁴¹ N. AM. ELEC. RELIABILITY CORP., 2013 SPECIAL RELIABILITY ASSESSMENT: ACCOMMODATING AN INCREASED DEPENDENCE ON NATURAL GAS FOR ELECTRIC POWER; PHASE II: A VULNERABILITY AND SCENARIO ASSESSMENT FOR THE NORTH AMERICAN BULK POWER SYSTEM 3-4 (MAY 2013).

¹⁴² FirstEnergy Comments, Ex. 6 (“Chao Aff.”) at 11, *Grid Resiliency Pricing Rule*, FERC Docket No. RM18-1-000 (Oct. 23, 2017).

Unless immediate action is taken, the continued retirement of nuclear and coal-fired generating units—by breeding greater dependence on generation fueled by natural gas, which is subject to supply disruptions, constrained pipeline capacity, a general inability to store fuel on-site, and competing demand from consumer heating in winter months—will increasingly result in significant, negative outcomes for the approximately 65 million people living and working within the PJM footprint. These harmful consequences include increased electric price volatility, lessened grid resilience and dependability, uncertain electric security in the future, decreased economic stability, and severe job losses—especially in the coal sector—as both power plants and fuel suppliers declare bankruptcy and cease operations. Combined, these conditions are potentially disastrous for the electric grid and the economy. PJM itself recently found that as the “resource mix moves in the direction of less coal and nuclear generation, generator reliability attributes of frequency response, reactive capability and fuel assurance decrease. . . .”¹⁴³

This is not idle speculation. As illustrated over the period of extreme cold in the eastern U.S. from December 27, 2017, through January 8, 2018, PJM was able to maintain reliability on its system in large part due to the strong performance from nuclear and coal-fired generators—performance that well exceeded those plants’ commitments in PJM’s capacity auction. In contrast, natural gas-fired plants were operating well below expected levels. Without these fuel-secure baseload generating resources, many of which are facing imminent retirement, the outcome may have been much different. And with temperatures well below freezing throughout virtually all of PJM during this time, a different outcome could have been catastrophic to public health and safety.

The challenges are not limited to just PJM, but are rampant in competitive electric markets throughout the Nation. While traditional vertically integrated utilities continue to provide safe, reliable, and affordable electric generation service every day, areas with RTO markets face problems resulting from the failure to recognize the importance of fuel security and fuel diversity. These incidents provide insight into vulnerabilities potentially facing PJM:

February 26, 2008 Wind Decrease in ERCOT: An unexpected drop in wind generation coupled with a demand increase from cold weather caused ERCOT to have to cut service to large industrial customers.¹⁴⁴ ERCOT had 10 minutes to curtail nearly three percent of the system load to avoid blackouts.¹⁴⁵

¹⁴³ PJM INTERCONNECTION, PJM’S EVOLVING RES. MIX AND SYSTEM RELIABILITY 5 (Mar. 30, 2017).

¹⁴⁴ Eileen O’Grady, *Loss of Wind Causes Texas Power Grid Emergency*, REUTERS (Feb. 27, 2008), <http://www.reuters.com/article/us-utilities-ercot-wind-idUSN2749522920080228?feedType=RSS&feedName=domesticNews&rpc=22&sp=true>; E. ELA & B. KIRBY, NAT’L RENEWABLE ENERGY LAB., ERCOT EVENT ON FEBRUARY 26, 2008: LESSONS LEARNED (July 2008), <http://www.nrel.gov/docs/fy08osti/43373.pdf>.

¹⁴⁵ See Eileen O’Grady, *Loss of Wind Causes Texas Power Grid Emergency*, REUTERS (Feb. 27, 2008), <http://www.reuters.com/article/us-utilities-ercot-wind-idUSN2749522920080228?feedType=RSS&feedName=domesticNews&rpc=22&sp=true>.

February 2011 Cold Weather in ERCOT: Rolling blackouts affected 3.2 million customers and, had ERCOT not shed load, a widespread, uncontrolled blackout would have occurred.¹⁴⁶

New England ISO Winter Reliability Program: Since 2014, the New England Independent System Operator Inc. (“ISO New England”) has had to establish winter reliability programs in an attempt to ensure continued operation of natural gas-fired generators during periods of cold weather.¹⁴⁷ Pipeline capacity issues, first identified in 2004, remain issues today and have yet to be solved by the competitive marketplace.¹⁴⁸ As ISO New England recently noted, “[i]n New England, the most significant resilience challenge is fuel security—or the assurance that power plants will have or be able to obtain the fuel they need to run, particularly in winter—especially against the backdrop of coal, oil, and nuclear unit retirements, constrained fuel infrastructure, and the difficulty in permitting and operating dual-fuel generating capability.”¹⁴⁹ ISO New England thus concluded that “while New England is meeting its resource adequacy requirements for capacity—which are based on expected summer peak demands—with the market mechanisms that are in place today, from an energy availability standpoint, the shift from generators with on-site fuel to generators relying on ‘just-in-time’ fuel delivery is challenging the system’s adequacy and, therefore, its resilience, particularly during winter peak demands.”¹⁵⁰ Indeed, in nearly all of the fuel mix scenarios studied by ISO New England, there would be “[e]nergy shortfalls due to inadequate fuel . . . requiring frequent use of emergency actions to keep power flowing and protect the grid.”¹⁵¹ These emergency actions could include rolling blackouts.¹⁵²

2016-2017 Aliso Canyon in CAISO: A leak at the Aliso Canyon natural gas storage facility was discovered in October 2015, causing the facility to close to subsequent injections until July 2017.¹⁵³ Although Aliso Canyon continues to operate, the California Public Utilities Commission

¹⁴⁶ FEDERAL ENERGY REGULATORY COMM’N & N. AM. ELEC. RELIABILITY CORP., REPORT ON OUTAGES AND CURTAILMENTS DURING THE SOUTHWEST COLD WEATHER EVENT OF FEBRUARY 1-5, 2011 1 (2011).

¹⁴⁷ Press Release, ISO New England, Winter 2015/2016: Sufficient Power Supplies Expected to Be Available (Dec. 1, 2015), *available at* https://www.iso-ne.com/static-assets/documents/2015/12/20151201_winter_outlook_release_final.pdf.

¹⁴⁸ Peter Brandien, Vice President, Operations, ISO New England, Panel Discussion Remarks at 1, *Winter 2016-2017 Operations and Market Performance in Regional Transmission Orgs. and Indep. Sys. Ops.*, FERC Docket No. AD16-24-000 (Oct. 20, 2016).

¹⁴⁹ ISO New England, Response of ISO New England at 1, *Grid Resilience in Regional Transmission Organizations and Independent System Operators*, FERC Docket No. AD18-7-000 (Mar. 9, 2018).

¹⁵⁰ *Id.* at 8.

¹⁵¹ *Id.*, Attachment A at 4-5.

¹⁵² *Id.* In contrast to PJM, which is looking to FERC for guidance and direction, ISO New England is taking initiative and studying fuel security issues. *Id.* at 26.

¹⁵³ Rob Nikolewski, *Utility Resumes Injections at Aliso Canyon, Site of Massive Gas Leak*, SAN DIEGO UNION-TRIBUNE (Aug. 1, 2017), <http://www.sandiegouniontribune.com/business/sd-fi-aliso-reinjections-20170801-story.html>.

has opened a proceeding “to determine the feasibility of minimizing or eliminating the use of [the facility]”¹⁵⁴ and legislation was introduced to shut down the facility.¹⁵⁵

May 3, 2017 CAISO Emergency: Normal system operations quickly turned into an emergency when energy imports failed to materialize.¹⁵⁶ The impacts were heightened as the daily rapid decline of solar power occurred as evening approached.¹⁵⁷ The California Independent System Operator Inc. (“CAISO”) had minutes to deploy emergency reserves and quickly went from normal system operations to a Stage 1 Emergency.¹⁵⁸

Natural Gas Plant Bankruptcies: In 2016, two large natural gas-fired plants in California, totaling 1,778 MW, declared bankruptcy because they could not make sufficient revenues in the CAISO wholesale markets.¹⁵⁹ In 2017, Panda Temple Power’s 758 MW natural gas plant in Texas filed for bankruptcy.¹⁶⁰ GenOn Energy, with over 9,000 MW of gas-fired generation, filed for bankruptcy in 2017 as well,¹⁶¹ and recently announced the retirement of three gas-fired power plants located in Southern California due to “economic reasons.”¹⁶²

D. Emergency Action by the Secretary Is Required

Although FERC complied with the directive of the Secretary pursuant to Section 403 of the DOE Organization Act in issuing a Notice of Proposed Rulemaking addressing these issues,¹⁶³ it has failed to undertake any action that will stem the tide of plant closures and thus prevent the impending crisis. You yourself said that “it is [FERC’s] immediate responsibility to take action

¹⁵⁴ CAL. PUB. UTILS. COMM’N, *Aliso Canyon Well Failure Order Instituting Investigation*, <http://www.cpuc.ca.gov/AlisoOII/> (last visited Mar. 22, 2018).

¹⁵⁵ Chris Megerian, *Proposal Would Close Aliso Canyon—But Not for A Decade*, L.A. TIMES (Sept. 14, 2017), <http://www.latimes.com/politics/essential/la-pol-ca-essential-politics-updates-aliso-canyon-leak-1505427333-htmlstory.html>.

¹⁵⁶ Jason Fordney, *California Grid Emergency Comes Days After Reliability Warning*, RTO INSIDER (May 8, 2017).

¹⁵⁷ *Id.*

¹⁵⁸ *Id.*

¹⁵⁹ Herman K. Trabish, *As Gas Plants Struggle, California Seeks New Flexible Capacity Strategies*, UTILITY DIVE (June 27, 2017), <http://www.utilitydive.com/news/as-gas-plants-struggle-california-seeks-new-flexible-capacity-strategies/445760/>.

¹⁶⁰ *Id.*; Cody Weems, *Panda Temple I Plant Files for Chapter 11 Bankruptcy*, TEMPLE DAILY TELEGRAM (May 11, 2017), http://www.tdtnews.com/news/article_efa76536-36a3-11e7-8b73-034537689093.html.

¹⁶¹ Herman K. Trabish, *As Gas Plants Struggle, California Seeks New Flexible Capacity Strategies*, UTILITY DIVE (June 27, 2017), <http://www.utilitydive.com/news/as-gas-plants-struggle-california-seeks-new-flexible-capacity-strategies/445760/>; see also Andrew Scurria & Patrick Fitzgerald, *GenOn Energy Files for Chapter 11 Bankruptcy Protection*, WALL ST. J. (June 14, 2017), <https://www.wsj.com/articles/genon-energy-files-for-chapter-11-bankruptcy-protection-1497445051>.

¹⁶² Samantha Masunaga, *NRG Subsidiary to Close Three Power Plants in Southern California*, L.A. TIMES (Mar. 9, 2018), <http://www.latimes.com/business/la-fi-nrg-plants-20180309-story.html>.

¹⁶³ Grid Resiliency Pricing Rule, 82 Fed. Reg. 46,940 (Oct. 10, 2017).

to ensure that generation resources with on-site fuel supplies and the ability to provide essential energy and ancillary reliability services including voltage support, frequency services, operating reserves, and reactive power are fully valued. . . .”¹⁶⁴ But FERC failed to do so and there is no indication that meaningful and substantive action by FERC will come in time to stem the tide of plant closures.

The DOE correctly recognized that the “recent Polar Vortex, as well as the devastation from Superstorm Sandy and Hurricanes Harvey, Irma, and Maria, reinforces the urgency that [FERC] must act now.”¹⁶⁵ Further, as you observed, “over the past several years, [FERC] has developed an extensive record on price formation [issues] in [FERC] approved ISOs and RTOs.”¹⁶⁶ And, as you recently noted, “[t]he voluminous comments filed in the [FERC NOPR] proceeding provide substantial evidence of, and otherwise confirm, the threat to the nation’s electricity grid and the urgent need for [FERC] action to reform market rules to preserve fuel-secure generation resources.”¹⁶⁷ Despite the urgency and its extensive record, FERC has failed to take the action necessary to address the emergency in PJM.

As you correctly noted, “it is especially urgent to prevent premature retirements of the resources that have these critical [fuel-secure] attributes.”¹⁶⁸ As a result of FERC’s and the RTOs’ failure to address this crisis, swift and decisive action is needed *now* to address this imminent loss of nuclear and coal-fired baseload generation and the threat to the electric grid that this loss poses. The Secretary needs to immediately issue an emergency order, pursuant to his authority under section 202(c) of the Federal Power Act, 16 U.S.C. § 824a(c), to ensure that baseload nuclear and coal-fired generators in PJM do not retire prematurely and are fully compensated for the benefits and services that they provide, as more fully described in Section II.B above. The order should find that an emergency exists because of the recent and imminent critical reduction in nuclear and coal-fired generation capacity, which threatens generation diversity, resiliency, dependability, and electric security in PJM. As this winter’s events revealed, without the availability of these critical, fuel-secure plants during extreme weather events (which can happen at any time during the year— not just in the winter), the PJM grid will likely experience reliability issues.

E. Information Required by Section 205.373

Applicants provide below the information called for by Section 205.373 of DOE’s regulations.¹⁶⁹ To be clear, Applicants’ request in this application applies to *all* eligible plants in

¹⁶⁴ Secretary Extension Letter at 1.

¹⁶⁵ Dep’t of Energy, Notice of Proposed Rulemaking to FERC at 11 (Sept. 28, 2017).

¹⁶⁶ Secretary NOPR Letter at 6.

¹⁶⁷ Secretary Extension Letter at 1.

¹⁶⁸ Secretary NOPR Letter at 1.

¹⁶⁹ 10 C.F.R. § 205.373. Certain elements of Section 205.373 address the circumstances of an applicant facing a shortage of real power and the prospect of firm customer curtailment, but do not address the emergency circumstances described herein, which involve a threat to the system more broadly. Applicants have indicated where these requirements are not applicable to the circumstances at hand.

PJM, not just those that they themselves own and operate. However, at this time Applicants only possess the required information for their own plants. To address this fact, Applicants request that the Secretary require PJM to obtain such information immediately from all eligible generators and begin negotiating agreements for the continued operation and appropriate compensation of such units.

a) Legal name of applicants. The applicants are FirstEnergy Generation, LLC, FirstEnergy Nuclear Generation, LLC, FirstEnergy Nuclear Operating Company, and FirstEnergy Generation Mansfield Unit 1 Corp. This application refers to these entities, collectively, as “Applicants.”

b) Person to whom correspondence should be addressed. Correspondence with respect to this application should be directed to the following persons:

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c) Political subdivisions in which applicants operate and conduct business. Applicants own and operate certain nuclear and coal-fired generation assets, and provide energy-related products and services to retail and wholesale customers, in the states of Ohio and Pennsylvania.

d) Baseline data.

1) Daily peak load and energy requirements for each of the past 30 days, and projections for each day of the Emergency Period. These requirements are not applicable to Applicants’ request, which contemplates relief on a broad scale. Nonetheless, Applicants provide as Attachment B a chart showing the monthly output of nuclear and coal-fired generation in PJM for the period 2012 through 2017.

2) All capacity and energy receipts or deliveries to other electric utilities for each of the past 30 days. Applicants respectfully submit that such information is not applicable to the present application.

3) The status of all interruptible customers for each of the past 30 days, and anticipated status during the Emergency Period. Applicants respectfully submit that such information is not applicable to the present application. Applicants are requesting emergency relief to *avoid* the interruption of power supply to the 65 million customers in the PJM footprint.

- 4) All scheduled capacity and energy receipts or deliveries to other electric utilities during the Emergency Period. Applicants respectfully submit that such information is not applicable to the present application.
- e) A description of the emergency situation, any contingency plan, and the current level of implementation. The emergency situation faced by PJM and consumers of electric energy within its footprint is described above in Section I and Section II.B. Applicants do not have any contingency plan to provide power to the PJM market and its 65 million customers absent an order of the Secretary in accordance with the emergency relief requested herein. As explained above, nuclear and coal-fired generating units in PJM are closing at an alarming rate, with efforts to “save” generation for energy security having failed. Implementation prior to the Secretary granting emergency relief is unworkable.
- f) A showing that adequate electric service to firm customers cannot be maintained without additional power transfers. As explained above, the recent and imminent shut-down of nuclear and coal-fired generating units in PJM puts at risk the ability to provide firm, reliable electric service within the PJM footprint without emergency action to maintain the operation of these generating facilities.
- g) A description of any conservation or load reduction actions that have been implemented. PJM has implemented limited demand response efforts in recent years,¹⁷⁰ but these efforts, and future similar ones, cannot come close to replacing the nuclear and coal-fired generation at risk of loss.
- h) A description of efforts made to obtain additional power through voluntary means and the results of such efforts. Applicants respectfully submit that such information is not applicable to the present application because it is the responsibility of PJM, not Applicants, to balance load and resources within the PJM footprint. PJM’s efforts to obtain additional power through voluntary means has been limited to market redesign efforts, such as Capacity Performance, which have failed to add sufficient fuel-secure generating capacity to the PJM market. Additionally, PJM is “fuel neutral” and has undertaken no effort to maintain nuclear and coal-fired generation, which provides fuel diversity and helps ensure sufficiency of supply during times of spiking demand such as that experienced this past winter.
- i) A listing of proposed sources and any amounts of power necessary from each source to alleviate the emergency and a listing of any other “entities” that may be directly affected by the requested order. See Attachment A for listing of nuclear and coal-fired generation facilities in PJM. Applicants submit that firm power supply agreements between PJM and the owners of each nuclear and coal-fired generating facility in PJM satisfying the criteria set forth in Section II.F are necessary to alleviate the emergency. Such generating facilities provide significant

¹⁷⁰ See *PJM Markets FAQ*, PJM, <https://learn.pjm.com/three-priorities/buying-and-selling-energy/markets-faqs.aspx> (last visited Mar. 22, 2018).

benefits to energy markets and the public at large, including fuel security and diversity, but receive no reliable cost support and, instead, must rely on PJM's power markets which fail to compensate these generators for the full value of the benefits that they provide.¹⁷¹

- j) Specific proposals to compensate the supplying "entities" for the emergency services requested and to compensate any transmitting "entities" for services necessary to deliver such power. Applicants propose that, as long as an emergency continues to exist, subject generators and PJM shall operate pursuant to contracts developed and agreed upon by the parties themselves. As explained below, in the event that PJM and the generators are unable to agree to the contractual terms within fifteen (15) days of the issuance of the order, then Applicants request that the Secretary step in and determine the just and reasonable compensation and conditions.
- k) A showing that, to the best of the applicant's knowledge, the requested relief will not unreasonably impair the reliability of any "entity" directly affected by the requested order to render adequate service to its customers. The relief requested by Applicants is to *secure* the reliability of every entity and customer located within PJM's boundaries; no entities are expected to be reasonably or unreasonably impaired by the requested relief. Indeed, the requested relief is designed to enhance the ability of the subject generators and PJM to serve customers.
- l) Description of the facilities to be used to transfer the requested emergency service to the applicant's system. In order to retain the electric generation necessary to prevent and alleviate the emergency, the Secretary's order pursuant to Section 202(c) should apply to nuclear and coal-fired generators located within the PJM footprint that have a supply of fuel on-site sufficient to allow twenty-five (25) days of operation at full output, that are substantially compliant with all applicable federal, state, and local environmental laws and regulations, and that do not recover any of their capital or operating costs through rates regulated by a duly authorized state regulatory authority, municipal government, or energy cooperative. Such generating facilities provide significant benefits to energy markets and the public at large, including fuel security and diversity, but receive no reliable cost support and, instead, must rely on PJM's power markets which fail to compensate these generators for the full value of the benefits that they provide. Attachment A provides a listing of all nuclear and coal-fired generation facilities in PJM but only some of these facilities will likely satisfy the above criteria.
- m) A general or key map on a scale not greater than 100 kilometers to the centimeter showing, in separate colors, the territory serviced by each "entity" named in the application; the location of the facilities to be used for the generation and

¹⁷¹ Although PJM's markets fail to adequately compensate nuclear and coal-fired generators for the benefits that they provide, a subset of these generators may nevertheless recover their costs plus an acceptable rate of return through other regulatory mechanisms.

transmission of the requested emergency service; and all connection points between systems. Insofar as this application seeks action by the Secretary regarding all eligible plants in PJM, the type of map specifically requested is not relevant to this application. Nonetheless, Applicants attach as Attachment C a map of the PJM territory, and as Attachment D a map of Applicants' nuclear and coal-fired generating facilities. In addition, attached as Attachment E is a map issued by the PJM Market Monitor showing actual and planned retirements generating units from 2011 through 2020.

- n) An estimate of the construction costs of any proposed temporary facilities and a statement estimating the expected operation and maintenance costs on an annualized basis. Applicants respectfully submit that such information is not applicable to the present application. Due to the nature of Applicants' requested relief, there are no anticipated construction costs, and annualized operation and maintenance costs will remain roughly the same for subject facilities.

F. Requested Order

Applicants respectfully request that DOE issue an emergency order directing (i) the subject baseload nuclear and coal-fired generators to enter into contracts and all necessary arrangements with PJM, on a plant-by-plant basis, to generate, deliver, interchange, and transmit electric energy, capacity, and ancillary services to maintain fuel diversity and grid dependability and resiliency within the PJM region and (ii) PJM to pay such qualifying generating facilities just and reasonable cost-based rates that provide for full cost recovery consistent with ratemaking standards and principles or as otherwise necessary to ensure continued operations. In addition, the order should direct PJM to begin negotiating immediately with such generators on the terms of such supply.

Applicants respectfully request that each baseload generator eligible to participate—nuclear and coal-fired generators located within the PJM footprint that have a supply of fuel on-site sufficient to allow twenty-five (25) days of operation at full output, that are substantially compliant with all applicable federal, state, and local environmental laws and regulations, and that do not recover any of their capital or operating costs through rates regulated by a duly authorized state regulatory authority, municipal government, or energy cooperative—be compensated with just and reasonable rates that provide for full recovery of its fully allocated costs and a fair return on equity. The compensable costs used to establish this amount shall include, but are not necessarily limited to, operating expenses, costs of capital and debt, and a fair return on equity and investment. Just and reasonable rates shall provide for (a) full cost recovery consistent with ratemaking standards and principles or (b) full recovery of all costs necessary to ensure continued operations.¹⁷² If PJM and the owners are unable to agree to the contractual terms within fifteen

¹⁷² Certain nuclear and coal-fired units have, for financial reporting purposes, impaired the generating asset values based on the expectation that market revenues would not be sufficient to provide a return of and on invested capital. The fact that these assets were impaired for financial reporting purposes does not change the amount that was invested in the plant nor does it relieve their owners from their obligations to bondholders. As a result, the traditional cost-of-service model needs to be modified to allow cost recovery based on pre-impairment asset

(15) days of the issuance of the order, then Applicants request that the Secretary step in and determine the just and reasonable compensation and conditions.

Applicants request that payments begin on the effective date of each contract, and service under the contracts begin no later than sixteen (16) days after the issuance of the Order. If no agreement as to terms has been reached by this time, then the payment that the eligible generators receive for such service will be subject to true-up based on the just and reasonable rate that is ultimately prescribed.

Applicants request that the order become effective immediately and that, at a minimum, the order should remain in effect for four (4) years from the date of issuance or until the Secretary determines that the emergency has ceased to exist because the PJM markets have been fixed to properly compensate these units for the resiliency and reliability benefits that they provide, whichever is later.¹⁷³ Further, because the eligible nuclear and coal-fired generators must continue to substantially comply with all applicable federal, state, and local environmental laws and regulations, the provision in Section 202(c) limiting the duration to a 90-day period is not applicable.¹⁷⁴

values or it needs to be modified to allow a return on equity on the post-impairment asset value with an additional allowance for recovery of maturing debt in addition to interest expense.

¹⁷³ The Secretary has very broad authority to order “temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in [his] judgment will best meet the emergency and serve the public interest.” 16 U.S.C. § 824a(c)(1). As prior 202(c) orders reflect, “temporary” emergencies may vary greatly in length and may even be open ended. Indeed, in *Cross-Sound Cable*, the Secretary initially issued an order with a duration from August 14, 2003 until September 1, 2003, but later extended the order “until such time as the emergency identified in this order cease[d] to exist” Order No. 202-03-2 (Dep’t of Energy Aug. 28, 2003). In addition, the Secretary’s initial order to Mirant Corporation in 2005 lasted nearly 10 months. Order No. 202-05-3, *D.C. Pub. Serv. Comm’n*, Docket No. EO-05-01, at 10 (Dep’t of Energy Dec. 20, 2005).

¹⁷⁴ See 16 U.S.C. § 824a(c)(4)(A) (limiting the duration of a Section 202(c) order to 90 days if such order “may result in a conflict with a requirement of any Federal, State, or local environmental law or regulation”).

III. CONCLUSION

The time for talk is over. We find ourselves at a crisis point where significant baseload generation will cease to exist in RTO markets without quick and decisive intervention. Baseload generation does not have the luxury of time; the personal health and safety, economic development, jobs and livelihood of the communities where they are located, as well as our national security, hang in the balance.

It would also be a grave mistake to assume that there is no immediate emergency requiring immediate action now that winter is over. Premature nuclear and coal-fired plant closures know no season—as the announcement yesterday that FirstEnergy Solutions will deactivate over 4,000 MW of nuclear generation shows. The resilience and security of the electric grid can be jeopardized at any moment by any high-impact event—not just those that are weather driven. The health, safety, and welfare of the Nation, as well as our economic and physical well-being must be protected at all times from all potential threats to our electric grid.

As explained herein, Applicants respectfully request that the Secretary utilize the authority granted to DOE under Section 202(c) of the Federal Power Act and immediately issue the emergency order described above. Such quick and decisive intervention is necessary to avoid a crisis point where such baseload generation will cease to exist in RTO markets, and to ensure that nuclear and coal-fired generators operating within PJM are compensated fairly for their costs and the benefits that they provide such that they can continue to operate and ensure a dependable, affordable, safe, secure, and clean supply of electricity.

Respectfully submitted,

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Patricia A. Hoffman, Principal Deputy Assistant Secretary, DOE Office of Elec. Delivery & Energy Reliability

Attachments

CERTIFICATE OF SERVICE

I hereby certify that, in accordance with 10 C.F.R. § 205.372, I have or will shortly cause copies of the foregoing documents to be served on the parties listed below by causing copies of the same to be sent via overnight delivery.

Federal Energy Regulatory Commission
Delaware Public Service Commission
Illinois Commerce Commission
Indiana Utility Regulatory Commission
Kentucky Public Service Commission
Maryland Public Service Commission
Michigan Public Service Commission
State of New Jersey Board of Public Utilities
North Carolina Utilities Commission
Public Utilities Commission of Ohio
Pennsylvania Public Utilities Commission
Tennessee Public Utility Commissions
Commonwealth of Virginia State Corporation Commission
Public Service Commission of West Virginia
New York Public Service Commission
Public Service Commission of the District of Columbia
PJM Interconnection
ReliabilityFirst Corp.
SERC Reliability Corporation
AES Warrior Run
Avon Lake
B L England
Beaver Valley
Birchwood Power
Braidwood Generation Station
Brandon Shores
Brunner Island
Byron Generating Station
Calvert Cliffs Nuclear Power Plant
Cardinal
Chalk Point
Chambers Cogeneration LP
Chesterfield
Cheswick Power Plant
Clover
Conemaugh
Conesville
Cooper
Covington Facility
CP Crane

Davis Besse
Dickerson
Donald C Cook
Dover
Dresden Generating Station
East Bend
Edgecombe Genco
FirstEnergy Bruce Mansfield
FirstEnergy Fort Martin Power Station
FirstEnergy Harrison Power Station
FirstEnergy Pleasants Power Station
FirstEnergy W H Sammis
General James M Gavin
H L Spurlock
Herbert A Wagner
Homer City Generating Station
Indian River Generating Station
Ingredion Incorporated
J M Stuart
James River Genco
John E Amos
Joliet 9
Joliet 29
Keystone
Killen Station
Kincaid
LaSalle Generating Station
Limerick
Logan Generating Company
Longview Power Plant
Luke Mill
Mecklenburg Power Station
Miami Fort
Mitchell (WV)
Morgantown Generating Plant
Mountaineer
Mt Storm
North Anna
Orrville
Oyster Creek
P H Glatfelter
P H Glatfelter Chillicothe Facility
Painesville
Peach Bottom
Perry
Powerton

PSEG Hope Creek Generating Station
PSEG Salem Generating Station
Quad Cities Generating Station
Radford Army Ammunition Plant
Rockport
Spruance Genco
Surry
TalenEnergy Montour
TalenEnergy Susquehanna
Tennessee Eastman Operations
Three Mile Island
University of Notre Dame
Virginia City Hybrid Energy Center
W H Zimmer
Waukegan
Wausau Paper Middletown
Whitewater Valley
Will County
Yorktown

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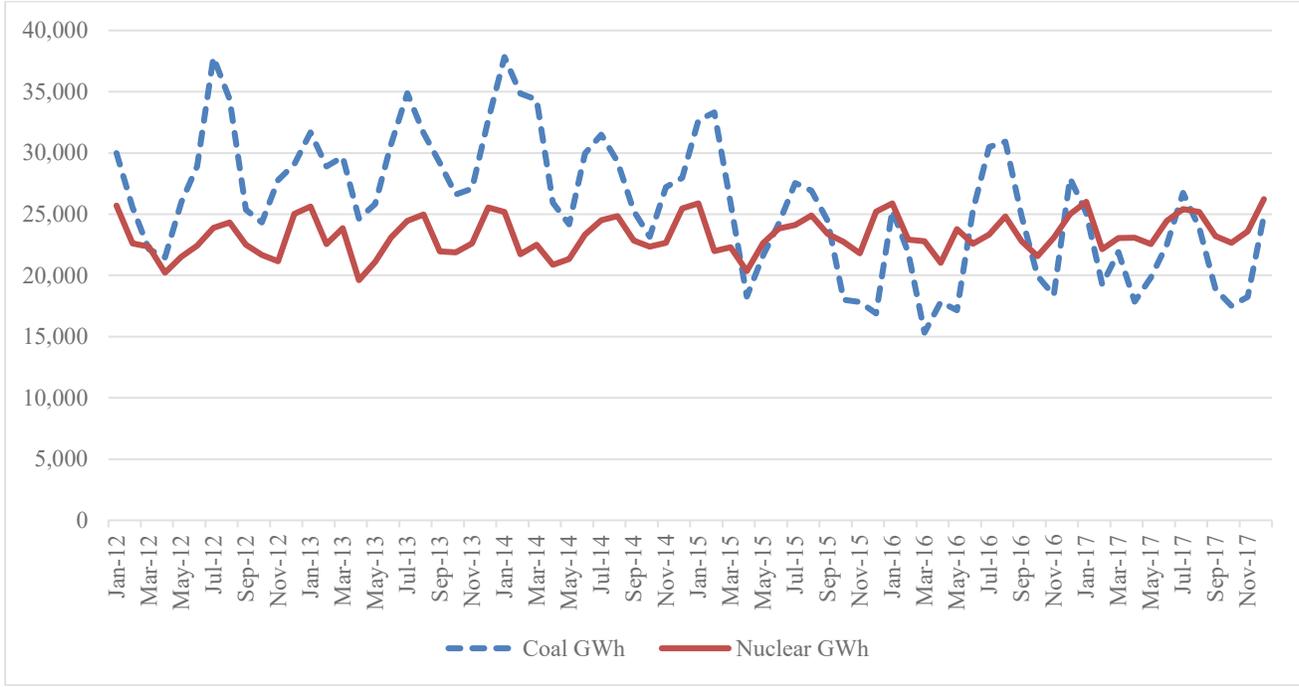
ATTACHMENT A
NUCLEAR AND COAL-FIRED GENERATING UNITS IN PJM
(NAMEPLATE CAPACITY)

Facility	Primary Owner (per EIA)	Coal (MW)	Nuclear (MW)
AES Warrior Run	AES WR Ltd Partnership	229	
Avon Lake	NRG Power Midwest LP	680	
Beaver Valley	FirstEnergy Nuclear Operating Co.		1846.8
Birchwood Power	Birchwood Power Partners LP	258.3	
Braidwood Generation Station	Exelon Nuclear		2449.8
Brandon Shores	Raven Power Holdings LLC	1370	
Brunner Island	Brunner Island LLC	1616.1	
Byron Generating Station	Exelon Nuclear		2449.8
Calvert Cliffs Nuclear Power Plant	Exelon Nuclear		1828.7
Cardinal	AEP Generation Resources Inc.	1880.4	
Chalk Point	NRG Chalk Point LLC	728	
Chambers Cogeneration LP	US Operating Services Company	285	
Chesterfield	Virginia Electric & Power Company	1352.9	
Cheswick Power Plant	NRG Power Midwest LP	637	
Clover	Virginia Electric & Power Company	848	
Conemaugh	GenOn Northeast Management Co.	1872	
Conesville	AEP Generation Resources Inc.	1729.3	
Cooper	East Kentucky Power Coop, Inc.	344	
Covington Facility	MeadWestvaco Corp.	44.5	
CP Crane	Raven Power Holdings LLC	399.8	
Davis Besse	FirstEnergy Nuclear Operating Co.		925.2
Dickerson	GenOn Mid-Atlantic LLC	588	
Donald C Cook	Indiana Michigan Power Company		2285.3
Dover	City of Dover, Ohio	27.5	
Dresden Generating Station	Exelon Nuclear		2018.6
East Bend	Duke Energy Kentucky Inc.	772	
Edgecombe Genco	Edgecombe Operating Services LLC	114.8	
FirstEnergy Bruce Mansfield	FirstEnergy Generation Corp.	2741.1	
FirstEnergy Fort Martin Power Station	Monongahela Power Company	1152	
FirstEnergy Harrison Power Station	Allegheny Energy Supply Co LLC	2052	
FirstEnergy Pleasants Power Station	Allegheny Energy Supply Co LLC	1368	
FirstEnergy W H Sammis	FirstEnergy Generation Corp.	2455.6	
General James M Gavin	AEP Generation Resources Inc.	2600	
H L Spurlock	East Kentucky Power Coop, Inc.	1608.5	
Herbert A Wagner	Raven Power Holdings LLC	495	

Facility	Primary Owner (per EIA)	Coal (MW)	Nuclear (MW)
Homer City Generating Station	NRG Homer City Services LLC	2012	
Indian River Generating Station	Indian River Operations Inc.	445.5	
Ingredion Incorporated	Ingredion Inc. - Illinois	45	
J M Stuart	Dayton Power & Light Company	1841.4	
James River Genco	Hopewell Operating Services LLC	114.8	
John E Amos	Appalachian Power Company	2932.6	
Joliet 9	Midwest Generations EME LLC	360.4	
Joliet 29	Midwest Generations EME LLC	1320	
Keystone	GenOn Northeast Management Co.	1872	
Killen Station	Dayton Power & Light Company	660.6	
Kincaid	Dynegy Kincaid Generation	1319	
LaSalle Generating Station	Exelon Nuclear		2340
Limerick	Exelon Nuclear		2277
Logan Generating Company	US Operating Services Company	242.3	
Longview Power Plant	Longview Power, LLC	807.5	
Luke Mill	NewPage Corp-Luke	65	
Mecklenburg Power Station	Virginia Electric & Power Company	139.8	
Miami Fort	Dynegy Miami Fort	1114.8	
Mitchell (WV)	Kentucky Power Company	1632.6	
Morgantown Generating Plant	GenOn Mid-Atlantic LLC	1252	
Mountaineer	Appalachian Power Company	1300	
Mt Storm	Virginia Electric & Power Company	1662.4	
North Anna	Virginia Electric & Power Company		1959.4
Orrville	City of Orrville, Ohio	84.5	
Oyster Creek	Exelon Nuclear		550
P H Glatfelter	P H Glatfelter Company	70.4	
P H Glatfelter Chillicothe Facility	P H Glatfelter Company	27.2	
Painesville	City of Painesville	53.5	
Peach Bottom	Exelon Nuclear		2621.8
Perry	FirstEnergy Nuclear Operating Co.		1311.6
Powerton	Midwest Generations EME LLC	1785.6	
PSEG Hope Creek Generating Station	PSEG Nuclear LLC		1290.7
PSEG Salem Generating Station	PSEG Nuclear LLC		2340
Quad Cities Generating Station	Exelon Nuclear		2018.6
Radford Army Ammunition Plant	U S Army-Radford	24	
Rockport	Indiana Michigan Power Company	2600	
Spruance Genco	Spruance Genco LLC	229.6	
Surry	Virginia Electric & Power Company		1695
TalenEnergy Montour	TalenEnergy Montour LLC	1775.1	
TalenEnergy Susquehanna	TalenEnergy Susquehanna LLC		2596

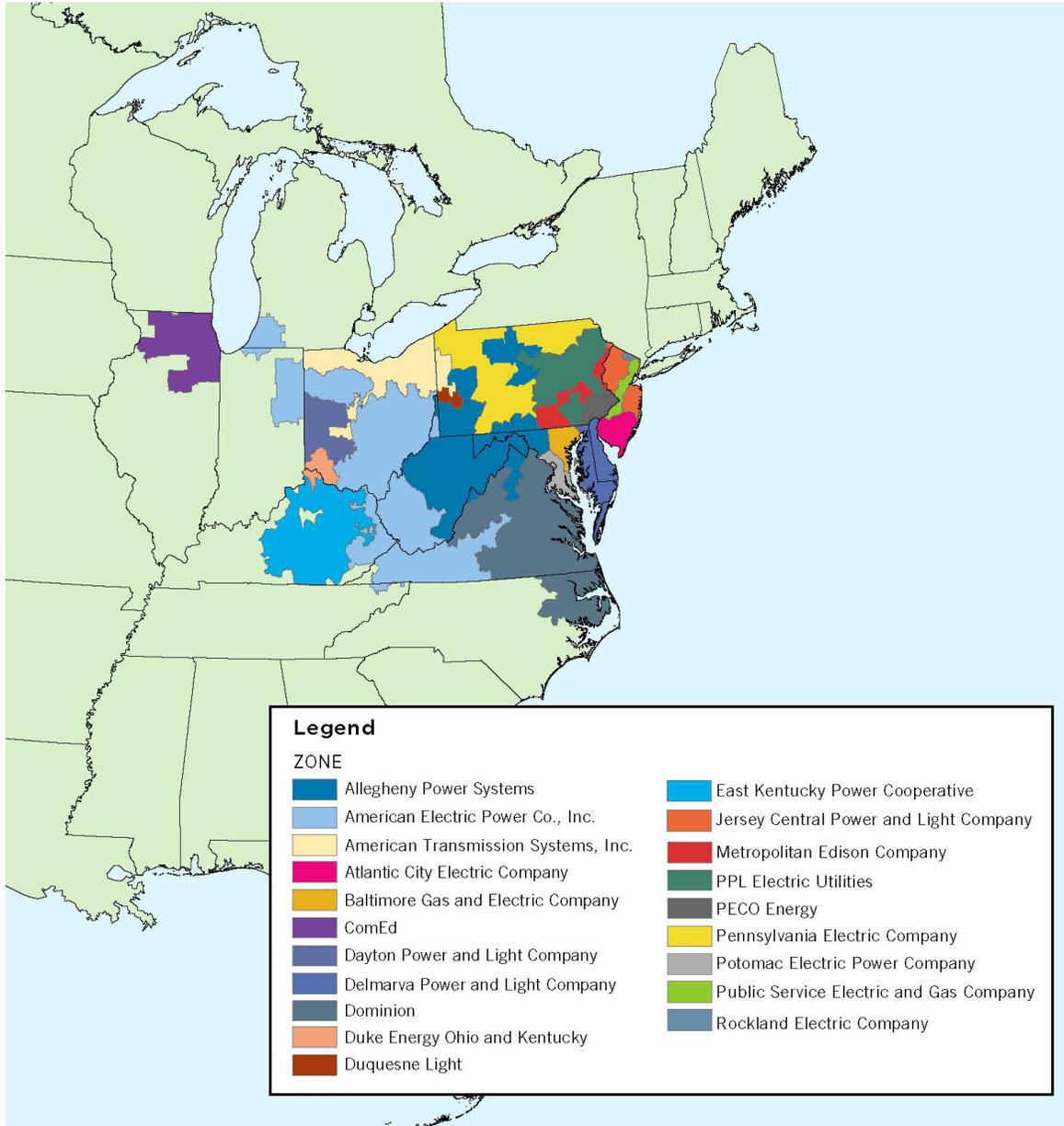
Facility	Primary Owner (per EIA)	Coal (MW)	Nuclear (MW)
Tennessee Eastman Operations	Eastman Chemical Company	194.3	
Three Mile Island	Exelon Nuclear		980.8
University of Notre Dame	University of Notre Dame	16.4	
Virginia City Hybrid Energy Center	Virginia Electric & Power Company	668	
W H Zimmer	Dynegy W H Zimmer	1425.6	
Waukegan	Midwest Generations EME LLC	681.7	
Wausau Paper Middletown	Wausau Paper Middletown	7.5	
Whitewater Valley	City of Richmond, Indiana	93.9	
Will County	Midwest Generations EME LLC	598.4	
Yorktown	Virginia Electric & Power Company	375	
Sources: 2016 Form EIA-860 Data (units with primary fuel of nuclear, or bituminous, refined, or subbituminous coal); PJM, FUTURE DEACTIVATIONS (Feb. 26, 2018), http://www.pjm.com/-/media/planning/gen-retire/pending-deactivation-requests.ashx?la=en .			

ATTACHMENT B
OUTPUT OF NUCLEAR AND COAL-FIRED GENERATORS IN PJM
INTERCONNECTION (GWH) (2012–2017)



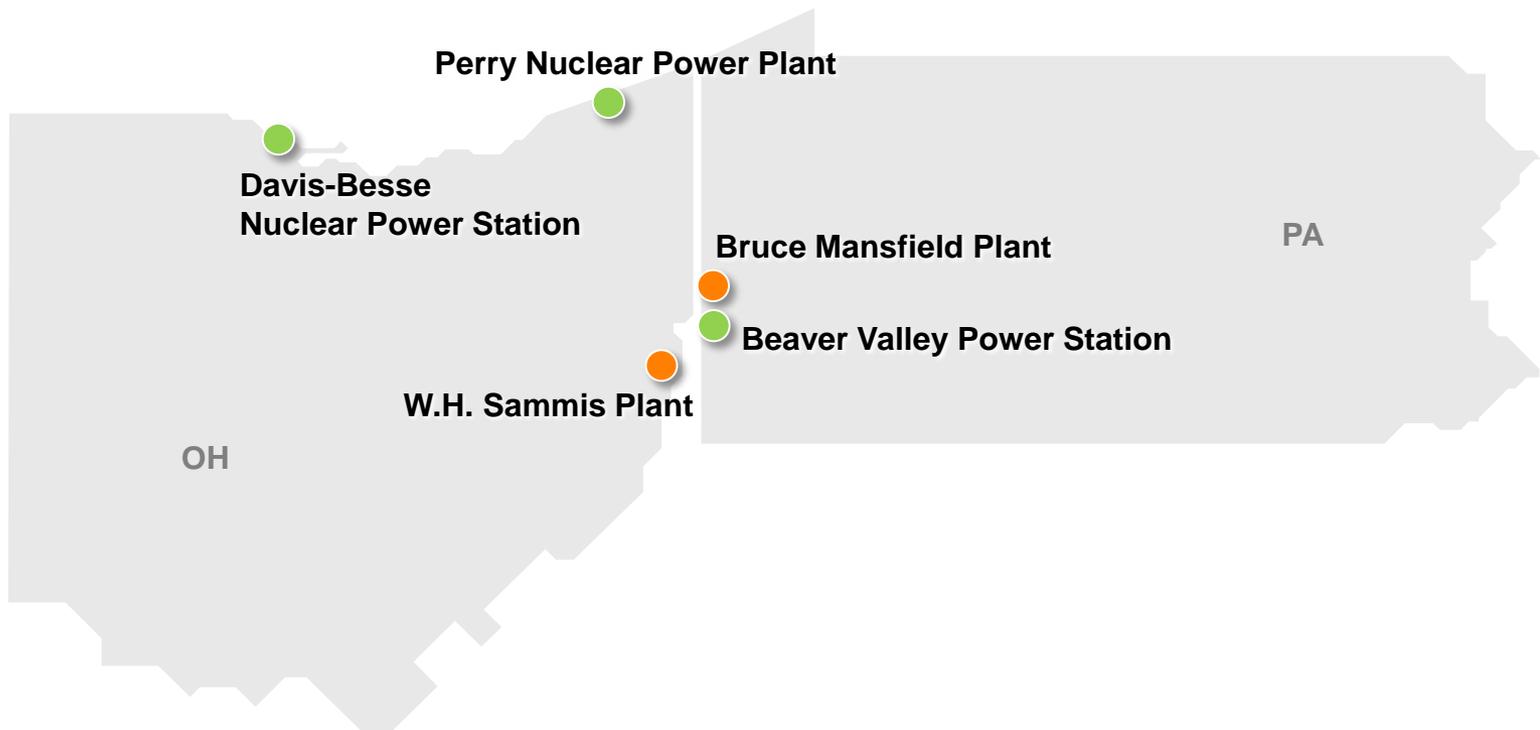
Source: Monitoring Analytics LLC, STATE OF THE MARKET REPORTS FOR PJM (2012–2017), http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2017.shtml.

ATTACHMENT C
MAP OF PJM INTERCONNECTION TRANSMISSION ZONES

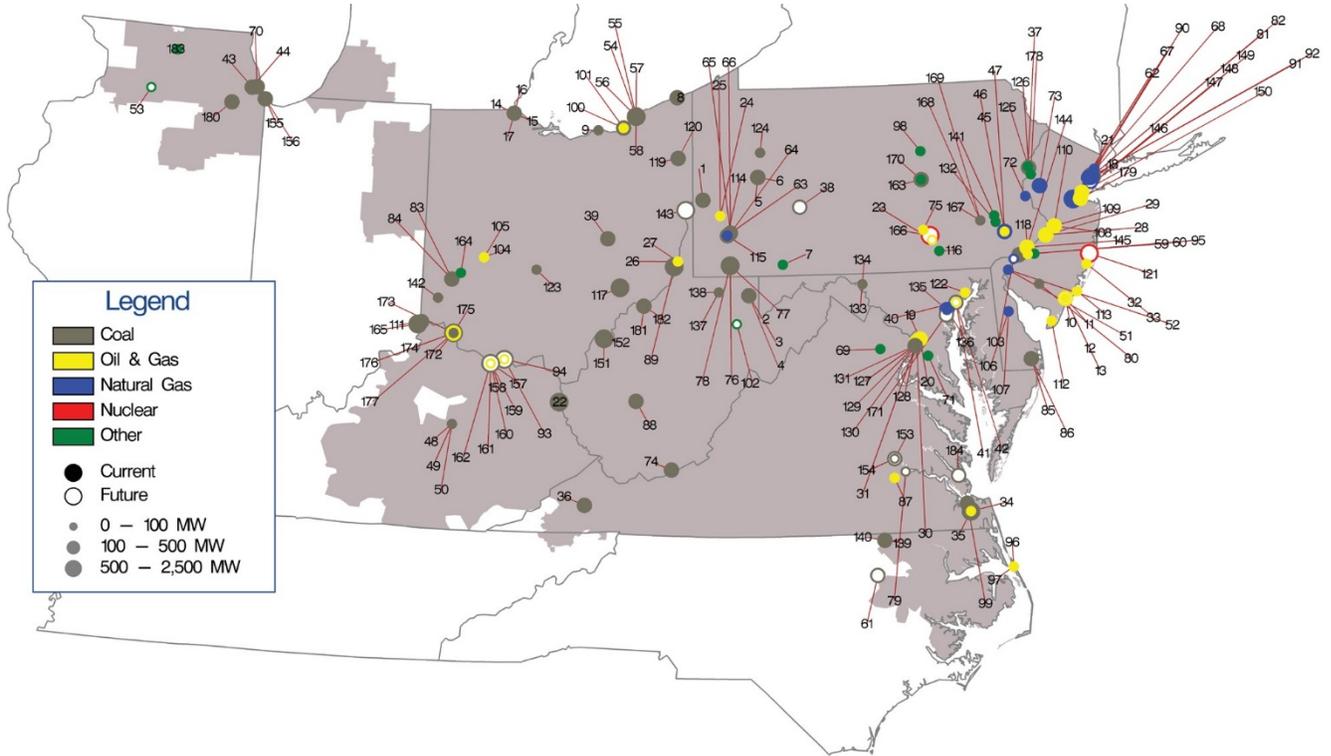


Source: PJM, <http://www.pjm.com/library/~~/media/about-pjm/pjm-zones.ashx>.

ATTACHMENT D
APPLICANTS' NUCLEAR AND COAL-FIRED GENERATING FACILITIES



ATTACHMENT E
ACTUAL AND PLANNED GENERATION RETIREMENTS IN PJM, 2011-2020



Key on following page.

Source: Monitoring Analytics LLC, STATE OF THE MARKET REPORT FOR PJM, 2017, http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2017.shtml, Figure 12-1.

Unit identification for map of PJM unit retirements, 2011 through 2020

ID	Unit	ID	Unit	ID	Unit	ID	Unit	ID	Unit	ID	Unit
1	AES Beaver Valley	36	Clinch River 3	71	GUDE Landfill	106	McKee 1	141	Rolling Hills Landfill Generator	176	Walter C Beckjord 5-6
2	Albright 1	37	Columbia Dam Hydro	72	Gilbert 1-4	107	McKee 2	142	SMART Paper	177	Walter C Beckjord GT 1-4
3	Albright 2	38	Colver Power Project	73	Glen Gardner 1-8	108	Mercer 1	143	Sammis 1-4	178	Warren County Landfill
4	Albright 3	39	Conesville 3	74	Glen Lyn 5-6	109	Mercer 2	144	Schuykill 1	178	Werner 1-4
5	Armstrong 1	40	Crane 1	75	Harrisburg 4 CT	110	Mercer 3	145	Schuykill Diesel	180	Will County 3
6	Armstrong 2	41	Crane 2	76	Hatfield's Ferry 1	111	Miami Fort 6	146	Sewaren 1	151	Willow Island 1
7	Arnold (Green Mtn. Wind Farm)	42	Crane GT1	77	Hatfield's Ferry 2	112	Middle 1-3	147	Sewaren 2	152	Willow Island 2
8	Ashtabula 5	43	Crawford 7	78	Hatfield's Ferry 3	113	Missouri Ave B,C,D	148	Sewaren 3	153	Winnabago Landfill
9	Avon Lake 7	44	Crawford 8	79	Hopewell James River Cogeneration	114	Mitchell 2	149	Sewaren 4	154	Yorktown 1-2
10	BL England 1	45	Cromby 1	80	Howard Down 10	115	Mitchell 3	150	Sewaren 6		
11	BL England 2	46	Cromby 2	81	Hudson 1	116	Modern Power Landfill NUG	151	Sporn 1-4		
12	BL England 3	47	Cromby D	82	Hudson 2	117	Muskingum River 1-5	152	Sporn 5		
13	BL England Diesel Units 1-4	48	Dale 1-2	83	Hutchings 1-3, 5-6	118	National Park 1	153	Spruance NUG1 (Rich 1-2)		
14	Bay Shore 1	49	Dale 3	84	Hutchings 4	119	Niles 1	154	Spruance NUG2 (Rich 3-4)		
15	Bay Shore 2	50	Dale 4	85	Indian River 1	120	Niles 2	155	State Line 3		
16	Bay Shore 3	51	Deepwater 1	86	Indian River 3	121	Oyster Creek	156	State Line 4		
17	Bay Shore 4	52	Deepwater 6	87	Ingenco Petersburg	122	Perryman 2	157	Stuart 1		
18	Bayonne Cogen Plant (CC)	53	Dixon Lee Landfill Generator	88	Kanawha River 1-2	123	Picway 5	158	Stuart 2		
19	Benning 15	54	Eastlake 1	89	Kanmer 1-3	124	Piney Creek NUG	159	Stuart 3		
20	Benning 16	55	Eastlake 2	90	Kearny 10	125	Portland 1	160	Stuart 4		
21	Bergen 3	56	Eastlake 3	91	Kearny 11	126	Portland 2	161	Stuart Diesels 1-4		
22	Big Sandy 2	57	Eastlake 4	92	Kearny 9	127	Potomac River 1	162	Stuart Diesels 1-4		
23	Brunner Island Diesels	58	Eastlake 5	93	Killen 2	128	Potomac River 2	163	Sunbury 1-4		
24	Brunot Island 1B	59	Eddystone 1	94	Killen CT	129	Potomac River 3	164	Tait Battery		
25	Brunot Island 1C	60	Eddystone 2	95	Kinsley Landfill	130	Potomac River 4	165	Tanners Creek 1-4		
26	Burger 3	61	Edgecomb NUG (Rocky 1-2)	96	Kitty Hawk GT 1	131	Potomac River 5	166	Three Mile Island Unit 1		
27	Burger EMD	62	Edison 1-3	97	Kitty Hawk GT 2	132	Pottstown LF (Moser)	167	Titus 1		
28	Burlington 8,11	63	Elrama 1	98	Koppers Co. IPP	133	R Paul Smith 3	168	Titus 2		
29	Burlington 9	64	Elrama 2	99	Lake Kingman	134	R Paul Smith 4	169	Titus 3		
30	Buzzard Point East Banks 1,2,4-8	65	Elrama 3	100	Lake Shore 18	135	Riverside 4	170	Viking Energy NUG		
31	Buzzard Point West Banks 1-9	66	Elrama 4	101	Lake Shore EMD	136	Riverside 6	171	Wagner 2		
32	Cedar 1	67	Essex 10-11	102	Laurel Mountain Battery	137	Riversville 5	172	Walter C Beckjord 1		
33	Cedar 2	68	Essex 12	103	MH50 Markus Hook Co-gen	138	Riversville 6	173	Walter C Beckjord 2		
34	Chesapeake 1-4	69	Fauquier County Landfill	104	Mad River CTs A	139	Roanoke Valley 1	174	Walter C Beckjord 3		
35	Chesapeake 7-10	70	Fisk Street 19	105	Mad River CTs B	140	Roanoke Valley 2	175	Walter C Beckjord 4		

Source: Monitoring Analytics LLC, STATE OF THE MARKET REPORT FOR PJM, 2017, http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2017.shtml, Table 12-6.