Public Interest Organization Comments on PJM's "Valuing Fuel Security" Process

Sierra Club, the Sustainable FERC Project, Natural Resources Defense Council, Environmental Defense Fund, and Earthjustice (Public Interest Organizations), offer these comments on PJM's proposed fuel security analysis, set out in its scoping paper entitled *Valuing Fuel Security* and released April 30, 2018.[1] Consistent with our positions in recent related proceedings, we think there are more effective ways to improve the grid's ability to recover from high impact events like severe storms than singling out "fuel security" for priority in study and implementation, absent more justification from PJM or discussion among stakeholders. Prematurely jumping to this conclusion has significant potential for discrimination against clean energy resources that are driving down costs and unnecessarily diverting ratepayer dollars to an initiative that offers little benefit.

These concerns are both conceptual and specific to PJM's proposed analysis, which discusses fuel security not in a technology-neutral way, but rather evinces an intention to have consumers pay more for resources with on-site fuel storage and dual-fuel capability. Several of the assumptions that PJM intends to use, most notably its unexplained assumption that the region will have far less capacity than has cleared the last several auctions, will result in a study that does not accurately represent the fuel security of the region. We urge PJM to revise these assumptions and be more forthcoming with stakeholders about how it intends to conduct this study and use the results.

1. Brief description of PJM's proposed process

PJM states that it "seeks to isolate" and study "one type of resilience risk: fuel security."[2] PJM defines fuel security as "the ability of the system's supply portfolio, given its fuel supply dependencies, to continue serving electric demand through credible disturbance events . . . which would impact the availability of generation over extended periods of time."[3]

PJM proposes that its evaluation of fuel security will comprise three phases. In the first phase ("Analysis"), PJM will "identify system vulnerabilities on a locational basis and develop fuel supply criteria to address those vulnerabilities."[4] PJM explains that this phase will also involve "determin[ing] attributes such as requirements for amounts of on-site fuel and dual-fuel capability" needed to ensure that load can be served during "realistic but extreme contingency

[1] *Valuing Fuel Security*, PJM (Apr. 30, 2018), http://www.pjm.com/-/media/library/reports-notices/special-reports/2018/20180430-valuing-fuel-security.ashx (hereinafter VFS).

[2] VFS at 1.

[3] *Id.*

[4] VFS at 2.

scenarios."[5] This "stress-test" is intended to "better understand reliability outcomes resulting from the current capability of local onsite fuel and back-up fuel."[6] PJM does not explain how fuel-free or demand-side resources will be considered in the Analysis phase. With respect to the Analysis phase, PJM provides high-level indicative assumptions and describes the capacity portfolio and disruption scenarios it will use for the "stress-test."[7]

In the second phase ("Modeling"), PJM will work with stakeholders to "incorporate vulnerabilities, on a locational basis, as constraints in PJM's capacity market."[8] PJM contends that this approach would properly value "needed locational attributes" and promote competition among resources that can provide those attributes.[9] PJM anticipates implementing these fuel security constraints in time for the May 2019 Base Residual Auction.[10]

The third phase ("Ongoing Coordination") involves PJM working with federal and state agencies to address specific security concerns, such as service to key military installations "and other identified security concerns."[11] PJM indicates that facilities that clear as "fuel-secure resources in the capacity market,"[12] and the fuel infrastructure they rely upon, would need to be "hardened" to physical and cybersecurity threats.[13]

2. PJM's focus on "fuel security" is unjustified

While we support PJM's efforts to ensure that it maintains a resilient and reliable grid, PJM's focus on "fuel security," as opposed to more cost-effective, higher value resilience measures, is misguided and will do little to maintain grid resilience. PJM should instead focus efforts on measures such as improving distribution and transmission systems, integrating distributed energy resources, and enhancing coordination and communication, all of which have an immediate impact on the resilience and reliability of the grid.

[5] *Id.*
[6] *Id.*
[7] *Id.* at 3–4.
[8] *Id.* at 3.
[9] *Id.*
[10] *Id.* at 2.
[11] *Id.* at 3.

a. Most outages result from transmission and especially distribution systems; generation-related solutions are not cost-effective at reducing outages

It is impossible to eliminate—and extremely costly to protect against—all threats to the power system. Further, PJM's time and resources are finite, as are the resources of customers in the PJM region. Therefore, it is critical that PJM focus its efforts on analyzing and implementing the highest-value measures that maintain PJM's resilience while reducing customer outages.

To assess the value of potential resilience measures, it is important to evaluate them from the customer's perspective. This is because we "do not build electric generation or transmission for their own sakes. Every element of the end-to-end power system—generation, fuel transportation systems, transmission, distribution, distributed generation and storage, end use devices and energy efficiency measures—exists to provide energy services for end-use customers."[14] A recent report by experts Alison Silverstein and Grid Strategies uses such a customer-centric framework to assess electric system resilience and concludes that the most effective resilience solutions center upon the wires connecting the grid.[15] According to the report, over 90 percent of customer outages are due to distribution-level problems and most are weather-related.[16] Conversely, generation shortfalls contribute a tiny fraction to customer outages—between 2012 and 2016, less than 0.01 percent of all customer-outage outage hours were caused by generation shortfalls (including only 0.00007 percent from fuel supply issues).[17]

As such, the most cost-effective and highest value resilience measures address distribution and transmission system improvements—specifically distribution, since most outages occur at this juncture—as well as customer protection efforts, such as distributed generation like energy storage, which can help customers survive outages more safely. By contrast, generation-related solutions are the least effective at reducing customer outages. PJM is therefore indisputably focusing its resilience efforts in an area that is not especially important to making its grid more resilient.

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[14] Alison Silverstein, Rob Gramlich, & Michael Goggin, *A Customer-Focused Framework for Electric System Resilience*, GRID STRATEGIES LLC (May 2018), https://gridprogress.files.wordpress.com/2018/05/customer-focused-resilience-final-050118.pdf (hereinafter Silverstein Report).

[15] *See generally* Silverstein Report.

[16] *Id.* at 16.

[17] *Id.* at 18–19; John Larsen, Peter Marsters, & Trevor Houser, *Electric System Reliability: No Clear Link to Coal and Nuclear* at 3, RHODIUM GROUP (Oct. 23, 2017), https://www.eenews.net/assets/2017/10/23/document_pm_06.pdf.

b. Fuel security is no guarantee of reliability or resilience during extreme conditions

In its *Valuing Fuel Security* paper, PJM asserts that its goal is to "identify triggering thresholds (such as simulated loss of load) that indicate locations on the system where additional fuel security assurance is needed."[18] Further, PJM notes that the Analysis phase is intended to determine what attributes, such as the ability to have on-site fuel, are necessary to ensure that PJM can meet peak demand under extreme conditions.[19] This framing overlooks, however, that no single unit or type of generation is "needed" or resilient in itself; rather, individual units or types of generation are valuable only within the broader context of the needs of the system. There is no "right mix" of characteristics or attributes. Interventions must focus on ensuring the functional services needed by the system to ensure that a discrete benefit is being provided.[20] In this case, since generation and fuel supply shortages rarely cause customer outages, the ability to maintain on-site fuel or provide fuel security assurance is not a high-value resilience attribute.

In fact, as previously demonstrated by events during the 2014 Polar Vortex, having on-site fuel supply does not even mean that those plants are able to generate when needed.[21] Thus, instead of compensating for idle capacity, the focus should be on compensating for delivered services that provide value to consumers.[22] As grid expert Michael Milligan has explained:

> What is important is the delivery of electrons and grid services and a good market design will be agnostic to how this is done. Resilience is a desirable outcome, but *the outcome should not be confused with methods to achieve it*. In collaboration with the RTOs/ISOs FERC *should pursue technology-neutral, performance-based frameworks for achieving a resilient bulk power system.*[23]

Similarly, according to a recent paper by R Street Institute, "market design reforms should center on incentive compatibility with the goal of maximizing economic performance for delivered service."[24] As Devin Hartman explains:

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[18] VFS at 1.

[19] *Id.* at 2.

[20] Silverstein Report at 7.

[21] *See generally Analysis of Operational Events and Market Impacts During the January 2014 Cold Weather Events*, PJM (May 8, 2014), https://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 (hereinafter PJM 2014 Study).

[22] Silverstein Report at 50.

[23] Reply Comments of Michael Milligan, Ph.D. at 9 (May 9, 2018), FERC Docket AD18-7 (hereinafter Milligan Comments); *see also* Silverstein Report at 50.

[24] Devin Hartman, *Enhancing Market Signals for Electric Resource Adequacy* at 14, R STREET INSTITUTE (Dec.13, 2017), https://2o9ub0417chl2lg6m43em6psi2i-wpengine.netdna-

> Unlike with energy, there is no simple way to measure and observe delivery of a forward capacity product. Such a lack of delivery verification can create performance incentive challenges, as conventional capacity markets compensate for ability but lack an incentive for actual delivery. Recent efforts to peg capacity payments to resource performance in the Mid-Atlantic and New England capacity markets rectify much of this missing incentive, but do so inefficiently. Energy-only markets remain the 'economic gold-standard for performance and investment-quality incentives.'[25]

Put another way, while a tall person can do different things than a short person, no short person is going to pay a tall person just for being tall—the short person must obtain some actual benefit, such as the tall person grabbing something off a tall shelf. Based on the available data, fuel security assurance has yet to demonstrate a relevant resilience benefit.

Meanwhile, coal and nuclear generation are not good at providing many high-value resilience and reliability services, such as flexibility, frequency regulation and response, and disturbance ride-through.[26] As such, PJM's goal should be to identify where the system could most benefit, not where "additional fuel security assurance is needed."[27]

c. Fuel security implicitly ignores the contributions of fuel-free and demand-side resources

By focusing on fuel security, PJM is implicitly ignoring the resilience contributions of fuel-free and demand-side resources.[28] These resources have demonstrated on multiple occasions their ability to support reliable electric service at times of severe stress on the grid. During the Polar Vortex, for example, when frozen coal stockpiles led to coal generation outages, wind and demand response resources were increasingly relied upon to help maintain reliability.[29] And more recently during Hurricane Harvey, wind energy contributed critical power while W.A. Parish, one of America's largest coal plants, was forced to shutter two of its units after its coal piles were flooded.[30]

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ssl.com/wp-content/uploads/2018/04/Final-123-1.pdf (hereinafter Hartman, *Enhancing Market Signals*).

[25] *Id.* at 6.

[26] Silverstein Report at 49.

[27] VFS at 1.

[28] *See, e.g.*, Milligan Comments., Reliability Service Capabilities Table; *see also* Silverstein Report, Appendix B – Reliability Service Capabilities for Major Energy Sources.

[29] *See generally* PJM 2014 Study.

[30] Wolf Richter, *Texas Wind Farms Might have Dodged a Bullet with Hurricane Harvey*, BUSINESS INSIDER (Sept. 4, 2017), http://www.businessinsider.com/texas-wind-farms-might-

According to Alison Silverstein and Grid Strategies, "[w]ell-designed markets allow each resource to play its best role, including storage and demand-side resources such as energy efficiency, distributed generation and demand response. Because no resource excels, either economically or technically, at providing all needed services at all times, the power system obtains services through a division of labor among different, pooled resources connected to a well-designed transmission grid."[31] As Michael Milligan explains:

> [h]igh-impact events are likely to require a deep system response that is best met by broad capabilities across many resource types. From a regulatory perspective, this means that artificial limits that prevent some resources from responding will be counter-productive, and to allow for maximum possible response from a deep resource pool, rules should be based on performance, not type. This means that reliability, resilience, and market rules should be technology-neutral and performance-based.[32]

To ensure that the grid can respond efficiently to any resilience challenges, market rules or regulations should not restrict or limit the types of resources that can participate—doing so would result in a combination of unnecessary costs and outages.[33]

3. PJM's proposed fuel security approach would impose costs on consumers and discriminate among resources without adequate justification

PJM's proposed approach to modeling fuel security constraints in the capacity market and providing additional compensation to resources that possess so-called fuel security attributes foreshadows a proposal that would impose unjustified costs on consumers and quite likely discriminate—without adequate basis—against certain capacity resource types.

a. PJM has not justified the value of additional spending on fuel security

Consumers should be asked to pay more for capacity only if they are receiving something of value in exchange. However, PJM's *Valuing Fuel Security* paper does not articulate the connection between what it seeks to procure and any improved reliability outcome. At the outset, PJM has defined what its market would procure in unclear terms, varying between "fuel security criteria" and "attributes" such as dual-fuel or fuel storage capabilities. However, as evident from the extensive record in FERC Docket No. RM18-1, having on-site fuel, or being

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have-dodged-a-bullet-with-hurricane-harvey-2017-9; Benjamin Storrow, *Flooded Texas Coal Piles Dampen Reliability Arguments*, CLIMATEWIRE (Sept. 29, 2017), https://www.eenews.net/climatewire/2017/09/29/stories/1060062093.

[31] Silverstein Report at 49.

[32] Milligan Comments at 20.

[33] *Id.* at 46.

able to burn a backup fuel, does not equal being able to always generate electricity or help the grid to recover from severe events. As PJM itself noted in its comments on that docket, the "DOE NOPR does not explain how maintaining a 90-day supply of fuel will enable quick restoration of service following a catastrophic grid event, which is a cornerstone concept of resilience."[34] The attribute of being dual-fuel capable or having onsite fuel, without more, is irrelevant to reliability.[35]

As such, it is not clear what additional reliability benefit customers would receive that is not already procured through other market or non-market mechanisms. PJM's assertion that "fuel security risks [are] not recognized under existing reliability standards" is unexplained and ignores the very active ongoing discussions about this exact question in FERC Docket AD18-7. As several experts have noted, "[t]here is no evident need to compensate generators or other assets for bulk power system resilience beyond the engineering-based reliability services already being procured."[36]

For instance, reliability targets like Loss of Load Expectation ("LOLE"), Loss of Load Hours ("LOLH"), and Estimated Unserved Energy ("EUE") limit the frequency, duration (and thus recovery time), and energy unavailable to serve load (and thus the magnitude) of the disturbance.[37] As PJM has previously explained, "PJM's capacity market has consistently secured Capacity Resources above and beyond the level needed to meet the NERC standard of no more than one expected loss-of-load event every ten years," specifically "reserve margins [that] are about four to six percentage points above the level needed to meet the NERC loss-of-load-expectation criteria."[38]

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[34] Initial Comments of PJM Interconnection, L.L.C. on the United States Department of Energy Proposed Rule at 6 (Oct. 23, 2017), FERC Docket RM18-1 (PJM Initial Comments).

[35] PJM Initial Comments at 13 ("[F]uel security, while beneficial, provides no guarantee of resilience during such events").

[36] Silverstein Report at 7; *see also id.* at 7 ("NERC has defined reliability to include post-outage recovery and restoration as well as outage avoidance. NERC defines reliability as the ability of the electric system to supply power at all times and withstand sudden disturbances – as so defined, reliability activities are those that attempt to prevent a grid outage.").

[37] *See, e.g.*, Samuel A. Newell *et al.*, *Estimating the Economically Optimal Reserve Margin in ERCOT* at vi, ERCOT (Jan. 31, 2014), http://www.ercot.com/content/wcm/lists/114801/Estimating_the_Economically_Optimal_Reserve_Margin_in_ERCOT_Revised.pdf. It may be worthwhile sharpening reliability targets in a way that clarifies their relationship to resilience. For example, different reliability targets convey information that capture frequency (1-in-10 LOLE), duration (24-in-10 LOLH) or magnitude (0.001% EUE) of disturbances, all of which are concepts "resilience" attempts to capture. *See, e.g.*, Jennifer Chen, *Is Capacity Oversupply Too Much of a Good Thing?*, 34 NAT. GAS & ELEC. 4 (Nov. 2017).

[38] PJM Initial Comments at 14–15.

The capacity market changes that PJM envisions are not only likely redundant with existing standards, but inconsistent with the approach that NERC has taken in developing such standards. As Michael Milligan explains:

> Rules that specify how a resilient system and are tied to specific technologies (such as those that use fuel) are not consistent with long-standing reliability rules such as the NERC Control Performance Standards (CPS) and Balancing Authority Area Limits (BAAL). Both of these are agnostic to how system balance is achieved, and instead specify what level of balancing is required.[39]

Even if PJM's new overlay on the capacity market were to marginally improve reliability in ways not already addressed by existing reliability standards, the costs may very well be excessive. Yet PJM shows no intent to analyze whether the costs of its proposal are sufficiently balanced by benefits to ratepayers. Reliability at all cost is not the appropriate standard.[40] As pointed out in several RTO/ISO responses to FERC in AD18-7, "it is not possible, nor even desirable, to ensure the power system can withstand all threats. In some cases, the cost of resilience could far exceed the cost of damage."[41] An increasing body of research shows that "generation-related solutions are generally not the most cost-effective means of reducing customer outages on power systems today."[42]

Numerous experts have suggested that the appropriate initial step is to undertake cost-benefit analyses of which risks are worth covering.[43] As Alison Silverstein and Grid Strategies explain:

> The best way to assess the cost-effectiveness of a reliability or resilience measure, and compare between measures, is to estimate its impact on the probability of outage frequency, magnitude and duration, and upon customer survivability. A constructive resilience analysis process will define resilience goals, articulate system and resilience metrics, characterize threats and their probabilities and consequences, and evaluate the effectiveness of alternative resilience measures for avoiding or mitigating the threats. Regulators and stakeholders should ask how each remedy (individually and in suites of solutions) might reduce the frequency, magnitude and duration of customer outages relative to the entire scope of

[39] Milligan Comments at 3.

[40] Hartman, *Enhancing Market Signals* at 4 ("[E]lectricity policy should seek the 'Goldilocks standard'—not too little, but not too much—by focusing on whether a system is *efficiently* reliable.").

[41] Milligan Comments at 15–16.

[42] Silverstein Report at 7.

[43] Milligan Comments at 15–16.

customer outages, not just those resulting from generation- or transmission-level causes.[44]

PJM's decision to single out fuel security from among resilience issues to tackle at this time—without an assessment of which issue is most cost-effective to address—is putting the cart before the horse. Further, it suggests a concern about certain generators and their economic viability, rather than a focus on what consumers need most to ensure grid resilience.

b. PJM's proposal is not fuel or technology neutral

Although PJM professes to be pursuing a fuel-neutral solution,[45] its desire to procure attributes such as "fuel storage" and "dual-fuel capability" shows a clear and unjustified preference for some resources over others. Renewable energy, storage, demand response, and price-responsive demand are all critical to maintaining balance during the "realistic but extreme contingency scenarios"[46] about which PJM is concerned. If PJM concludes that some fuel-security criteria are needed, it must ensure that its definition of these criteria extends to fuel-free resources. If additional measures are needed, we support the use of market-based approaches, but only if the product procured is truly fuel and technology neutral, without performance factors defined in a way that only some resources could possibly satisfy.

If PJM establishes a problem associated with fuel supply disruptions under realistic scenarios, it should procure additional needed service based on what resources can achieve, not *how* it can achieve that result. As noted above, compensation should be for delivered services, not attributes that may or may not ultimately enable a desired service. This also reflects good market design. As noted by Michael Milligan, "Good market design should be technology-neutral and performance-based. This means that any resource that is capable of providing a given service should be allowed to participate in the market. . . . [A] good market design will not specify "how" a service is provided, but instead should specify the parameters regarding the delivery of the product itself."[47]

PJM appears to be cognizant of the need to identify needed services in a fuel-neutral manner, but the *Valuing Fuel Security* scoping paper repeatedly evinces a preference or a bias for

[44] Silverstein Report at 5.

[45] *See, e.g.*, VFS at 5.

[46] *Id.* at 2.

[47] Milligan Comments at 8; see also *id.* at 9 ("Specifying 'how' a system complies with a balancing obligation, reliability obligation, or resilience obligation is generally an over-specification. Barring other social goals, such over-specification will generally increase cost and discriminate against resources that are physically able to provide the service, but that are prevented because of market or reliability rules.").

certain fuel and technology types, which creates uncertainty as to whether PJM's ultimate mechanism will be unduly preferential.

c. Impact of fuel security overlap on PJM's capacity markets

PJM's proposal to pursue fuel security through its capacity market is problematic for several reasons. That market is increasingly laden with administrative adjustments, many of which, like Capacity Performance, have only just been fully implemented and to which market participants are still adjusting. Market participants also face a number of proposed adjustments that may still be implemented before the next auction, such as PJM's dueling capacity repricing and MOPR-Ex proposals. The proliferation of adjustments, implemented at a breathtaking pace, makes it very difficult for market participants to respond to the market's price signals. PJM's wholesale markets, and, indeed, all wholesale markets, were created to provide market signals for assuring resource adequacy at the least cost to consumers.[48]

The impact of Capacity Performance on these signals, and the resulting behavior of market participants in terms of investments or operational changes, are only beginning to be observable. PJM had promised an assessment of the impacts of its Capacity Performance rule changes but has yet to release that study. Further changes to the capacity market's selection and compensation of resources is premature if just and reasonable rates to assure resilience are the goal. Just a few months ago, PJM identified several steps that could be taken to address fuel security, such as enhancing gas-electric coordination, and analysis of tracking and transportation of fuel oil.[49] PJM should reevaluate whether fuel security can be improved through informational and coordination measures of this type, rather than changes to the capacity market.

Ironically, Capacity Performance was intended to address generator nonperformance from, among other factors, inadequate fuel supply.[50] While PJM now asserts that Capacity Performance only "ensures that individual resources are prepared to perform when the system needs them most,"[51] it is also the case that Capacity Performance, *if* the penalties and incentives

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[48] *See* Order 2000, 89 FERC ¶ 61,285 (Dec. 20, 1999).

[49] *PJM Cold Snap Performance Dec. 28, 2017 to Jan. 7, 2018* at 33, PJM (Feb. 26, 2018), http://www.pjm.com/-/media/library/reports-notices/weather-related/20180226-january-2018-cold-weather-event-report.ashx (hereinafter Cold Snap Performance Report).

[50] PJM Initial Comments, 25–26 ("PJM's "Capacity Performance" reforms adopted market solutions to the generation challenges wrought by events like the Polar Vortex by: (1) incentivizing better performance by paying generators for performance and allowing recovery of investments to enhance operational reliability (e.g., *firming fuel supply, investing in dual-fuel capability*, increased staffing, capital investments for better operational flexibility, and cold-weather testing on alternate fuels); and (2) discouraging poor performance by imposing a strong monetary penalty (with limited exceptions).") (emphasis added).

[51] VFS at 2.

are calibrated correctly, will tend to benefit resources with fuel supplies not subject to disruption. In its response to the DOE NOPR, PJM touted this benefit of Capacity Performance,[52] but now asserts that a further layer of market changes are needed before the impacts of Capacity Performance have even been evaluated through the lens of resilience.

4. PJM's analytical approach to fuel security is flawed

a. General Comments

PJM has informed stakeholders about a handful of "high-level indicative assumptions,"[53] and offered sparse descriptions of the analysis scenarios and disruption simulations it will use to determine whether there are fuel security constraints. Below we provide more detailed feedback on the scenarios and disruption simulations, but first we offer some more general concerns about the analytical approach.

First, the timeframe for PJM's analysis is not stated in its overview paper. For example, it is unclear whether PJM will be looking at the immediate future, the 2022-2023 delivery year (corresponding to the 2019 BRA), or some other time period. The time-period of analysis is critical to selecting the proper load forecasts, accurately forecasting the amount of renewable energy and storage resources that will be online because of state policies, properly accounting for any planned changes to the transmission and pipeline systems, and many other factors.

By comparison, ISO-New England specified the 2024-2025 period for its Operational Fuel-Security Analysis, which enabled stakeholders to provide feedback on the accuracy of assumptions made around load, state policy implementation, energy imports and similar factors.[54] PJM's decision to not clearly state a specific time-period for its fuel security analysis means that it is difficult to assess the accuracy of several assumptions made by PJM.

Second, PJM does not explain what combination of analysis scenarios and disruption simulations will drive its redesign of the capacity market; it simply says that "[e]ach of these disruptions will be applied to the three capacity portfolio scenarios."[55] PJM should explain whether it plans, in Phase 2 of this process, to model constraints in the Base Residual Auction based on a high-stressed portfolio combined with the most extreme disruption scenarios, or whether there is some more moderate combination that it plans to employ as the basis for changes to the capacity market. The more extreme of a scenario that PJM chooses to model, the

[52] PJM Initial Comments at 8.

[53] VFS at 3.

[54] *See generally* Paul Peterson, Doug Hurley, & Pat Knight, *Understanding ISO New England's Operational Fuel Security Analysis* (May 3, 2018), https://www.clf.org/wp-content/uploads/2018/05/Understanding-ISO-NE-OFSA1.pdf.

[55] VFS at 4.

greater the impact to consumers. As explained above, reliability should not be ensured at any cost, particularly where the claimed threats to reliability rest upon unrealistic capacity portfolios or highly unlikely disruption simulations.

Third, PJM does not appear to have any plans to evaluate potential cost to consumers as part of this analysis. The impact on consumers' capacity costs is a critical component of understanding whether any changes to RPM are just and reasonable. As such, PJM should explain when and how it plans to undertake that analysis and provide the information to stakeholders.

Finally, PJM intends to use market signals as "one data point to assist in valuing various alternatives such as the benefits of new pipelines, the benefits of resources with on-site fuel and the value of new technologies that promote an array of fuel-secure resources."[56] This market-based approach will be difficult to achieve without ensuring the requisite amount of transparency in the gas market to understand how pipeline capacity is allocated. PJM has observed that gas transactions often occur on a non-transparent basis on the secondary market and has stated that "the Commission should make sure that it is first ensuring that existing pipelines are being utilized most efficiently and in a manner which meets the needs not only of its seasonal load customers, such as LDCs, but also the needs of more short term and variable needs of the generation community."[57] Any solutions that do not also involve enhancement of price formation and transparency in the gas market will exacerbate suboptimal future outcomes.

b. Concerns regarding PJM's indicative assumptions

PJM states that "[g]enerator forced, planned and maintenance outage rates . . . will be consistent with recent winters."[58] While PJM does not define "recent" winters, PJM should not assume forced outage rates similar to those experienced during the 2014 Polar Vortex. As PJM has explained, both non-market and market reforms instituted since the Polar Vortex have significantly reduced forced outage rates among generators.[59] Full implementation of Capacity Performance, which went fully into effect only in the 2017 Base Residual Auction should be expected to further reduce forced outage rates. We would also expect PJM to continue to refine its Capacity Performance mechanism to ensure that it is providing the proper degree of incentive for generators to minimize forced outages.[60] It is not reasonable to assume that none of PJM's

[56] *Id.* at 1.

[57] Comments and Responses of PJM Interconnection, L.L.C., Docket No. AD18-7 at 58–69 (March 9, 2018).

[58] VFS at 3.

[59] *See* Cold Snap Performance Report at 14 ("[O]verall there was a large reduction in forced/unplanned outages between the 2014 Polar Vortex and the cold snap").

[60] As PJM noted in its recent Cold Snap Performance report, "[t]he operational data on outage performance for both coal and oil resources implies that there was no improvement for

prior reform efforts have their intended effects. In sum, we recommend that PJM assume *improved* forced outage rates for generators compared to recent winters as one would expect to result from various PJM initiatives.

PJM also explains that "oil-fired and dual-fuel generation withdrawals of oil and ease of replenishment will be modeled on a locational basis, taking into account the locational supply chain and contractual arrangements associated with such replenishments."[61] While it is unclear from PJM's brief description of this assumption, we urge PJM not to assume static supply chain and contractual arrangements. Instead, those arrangements should be assumed to change to respond to market dynamics. For example, as Capacity Performance is implemented, one would expect changes in these existing local supply chains and contractual arrangements as generators seek to firm their fuel supplies.[62] Assuming that supply chains and contractual arrangements will be fixed in the face of major market changes is inaccurate and unnecessarily pessimistic.

PJM also states that it will assume 2014 Polar Vortex loads, combined with 2017-2018 Cold Snap extended cold weather conditions.[63] This appears to be a highly conservative assumption regarding weather conditions—extreme wind chill on a prolonged basis that would deplete stored fuel and strain insufficiently weatherized facilities. While this combination of challenging weather conditions is a valid circumstance to examine, PJM must take care that its assumptions are realistic and credible.

In this case, PJM should ensure that it fully accounts for key factors affecting load, which may not have been present to the same extent in 2014, such as increased penetrations of distributed generation, price responsive demand, more stringent appliance efficiency standards, and demand response resources. Given the uncertainty around the time period that PJM plans to study (see above), it is difficult to provide more concrete suggestions on this topic.

[Capacity Performance] resources," and that further analysis was necessary to understand why. Cold Snap Performance Report at 20. PJM only recently called its very first Capacity Performance assessment interval. Rory D. Sweeney, *PJM Experiences First Load Shed of the CP Era*, RTOINSIDER (June 3, 2018), https://www.rtoinsider.com/pjm-capacity-performance-load-shedding-93603/. This suggests that PJM's decision to base Capacity Performance penalties on an estimate of 30 performance hours annually may need to be recalibrated to provide adequate incentive for Capacity Performance units to meet their obligations.

[61] VFS at 3.

[62] *See* Cold Snap Performance Report at 20 ("[T]he gas fuel type shows improved results for [Capacity Performance] resources. When compared to 2014, this could be an indication that gas [Capacity Performance] was better prepared through increased firmness of transportation capacity and supply, along with a greater diversity of natural gas supply resources and delivery options.").

[63] VFS at 4.

Finally, we note that key assumptions critical to the fuel security analysis are unstated. For example, PJM does not state what it will assume in terms of local gas utility demand, which had a significant effect on the results of ISO New England's OFSA.[64] Nor does PJM explain how its analysis will treat any planned but not yet completed construction of transmission, pipeline, or fuel storage infrastructure. We recommend that PJM confer with stakeholders to test such assumptions prior to conducting its analysis.

c. Concerns regarding PJM's capacity portfolio scenarios

PJM proposes three capacity portfolio scenarios: base, stressed, and high-stressed. The Base Portfolio includes the "2020-21 PJM resource portfolio with scheduled retirements in addition to other retirements in order to have the Installed Reserve Margin (IRM) equal to the approved value of the 2017 PJM Reserve Requirement Study of 16.6 percent."[65] In other words, as its most optimistic portfolio, PJM assumes away the very high reserve margins currently seen in the region, and those procured under each of the most recent BRAs. The 2017 Base Residual Auction cleared capacity equivalent to a 23.9% reserve margin, or 23.3% when accounting for Fixed Resource Requirement, which is 6.7% higher than the target reserve margin.[66] The 2018 Base Residual Auction cleared capacity representing a 22 percent reserve margin, or 21.5 percent when accounting for Fixed Resource Requirement, which is 5.7 percent higher than the target reserve margin of 15.8 percent.[67] Put another way, in the 2017 and 2018 base residual auctions, PJM has cleared capacity that exceeds its target reserve margin by 40 percent and 36 percent, respectively.

PJM offers no explanation as to why its reserve margin would suddenly shrink by over one-third or why the cleared capacity over its target reserve margin should be ignored when evaluating fuel security. Certainly units with capacity supply obligations will not be retiring before the end of the delivery year, and PJM has proposed no changes to its variable resource requirement curve or other capacity market mechanics that would lead to substantially lower procurement closer to PJM's IRM. All of PJM's capacity portfolio scenarios should reflect currently obligated capacity resources, not the reserve margin requirement identified in a study that is significantly surpassed on a regular basis. If PJM plans to study a time-period five or more years into the future and has evidence that its capacity margins will shrink significantly in the meantime, it should share that information with stakeholders.

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[64] *See generally* Paul Peterson, Doug Hurley, & Pat Knight, *Understanding ISO New England's Operational Fuel Security Analysis* (May 3, 2018), https://www.clf.org/wp-content/uploads/2018/05/Understanding-ISO-NE-OFSA1.pdf.

[65] VFS at 4.

[66] *2020/2021 RPM Base Residual Auction Results*, PJM (May 23, 2017), https://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2020-2021-base-residual-auction-report.ashx.

[67] *Id.*

Nor does PJM explain whether it plans to consider uncleared capacity that participates in its energy markets. While the exact amount of such resources will fluctuate from year to year, there is a significant quantity of generation resources available to supply electricity during winter peak events that do not have supply obligations. If PJM were to implement the expanded minimum offer price rule that it has proposed,[68] the amount of uncleared capacity supplying energy would increase substantially.

While PJM's base portfolio is already unrealistically constrained, PJM envisions then evaluating "stressed" and "high-stressed" portfolios. The stressed portfolio would assume additional coal and nuclear retirements, while the high-stressed portfolio would assume even more coal and nuclear retirements and replacement with natural gas resources within the same zone. As a threshold matter, we note that PJM's framing of the stressed and high-stressed scenarios is not fuel neutral. PJM's description of these scenarios reveals its analytical bias that coal and nuclear contribute more to reliability than other fuel sources, despite significant evidence that coal plants, in particular, have numerous operational limitations affecting their availability during extreme weather events.[69]

Moreover, although the stressed and high-stressed cases assume additional coal or nuclear retirements beyond those already announced, PJM does not state the amount of such retirements or explain why those assumptions are reasonable scenarios to analyze.[70] For example, PJM's 2017 Regional Transmission Expansion Plan update, published just a few months ago, indicates that the portion of coal and nuclear in PJM's energy mix in 2023 will be substantially the same as in 2017.[71] If PJM plans to evaluate scenarios with more significant drops in coal and nuclear capacity, it should explain why such scenarios are realistic. Nor does PJM explain whether the coal and nuclear retirement scenarios it anticipates studying would take it outside of the wide bounds that PJM has previously asserted would create no resilience problems.[72] Without this information, it is impossible for stakeholders to understand whether the

[68] PJM Interconnection, L.L.C. Tariff Filing, Apr. 9, 2018, FERC Docket EL18-1314.

[69] *See* PJM Initial Comments at 12 ("Specifically, during the Polar Vortex, of the approximately 40,200 MW of forced generator outages in PJM, coal steam outages (considering all sources of failure) were the largest outage category, at 13,700 MW (representing 34% of the outages), and nuclear outages totaled 1,400 MW. Having a 90-day fuel supply would not have cured these outages, for it was not a lack of fuel that caused them.") (internal citations omitted).

[70] PJM's Nuclear will drop slightly from somewhat less than 20 percent today to about 18 percent in 2023. Coal will also be down from around 31 percent today to about 28 percent.

[71] *See 2017 PJM Regional Transmission Expansion Plan, Book 1* at Fig. 1.12, PJM (Feb. 28, 2018) (showing that nuclear will drop from somewhat less than 20 percent today to about 18 percent in 2023, while coal will be down from around 31 percent today to about 28 percent).

[72] PJM Initial Comments at 24 ("[T]he PJM region is more fuel diverse and resilient than vast regions without capacity and energy markets, and would remain so even if PJM reduced its

premises of PJM's analysis are reasonable. Given the uncertainty about which of these scenarios will drive PJM's redesign of RPM (see above), the omission of such details from this scoping document is concerning.

Finally, PJM's description of its indicative assumptions and scenarios fails to acknowledge the significant amount of renewable energy resources likely to come online in the near- to mid-term as a result of state policies and other economic drivers. The amount of such resources, as required by state policies, was detailed in PJM's recent Section 205 filing regarding capacity repricing and MOPR-Ex,[73] but additional resources are to be expected as a result of high corporate demand for renewable energy, and recently enacted state policies such as New Jersey's 50% renewable portfolio standard.[74] Increased renewable energy resources in the region would alleviate any risks associated with reliance on fuel deliveries, since those resources do not rely on fuel and have far fewer operational problems during extreme winter weather.[75] The ISO-NE OFSA study found that incorporating the full amount of renewable energy resources that state law requires to be procured reduced the modeled reserve shortages.[76] PJM does not state what kinds of resources it expects will replace the additional coal and nuclear retirements in the "stressed" scenario, but does assume 100% replacement of coal and nuclear with natural gas in the "high-stressed" scenario. Replacement of retiring resources with 100% natural gas is unrealistic in light of state policies and market trends.

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reliance on coal and nuclear (to, for example, the level maintained by the Southern Companies region), or increased its reliance on natural gas (to, for example, the level maintained in Florida or ERCOT).").

[73] *See* PJM, Capacity Repricing or in the Alternative MOPR-Ex Proposal: Tariff Revisions to Address Impacts of State Public Policies on the PJM Capacity Market (ER18-1314), at 27 ("Dr. Giacomoni also estimates that satisfying the current RPS obligations in the PJM Region would require nearly 5,000 MW of "around-the-clock capacity (located and metered in the PJM Region)," and that is scheduled under current law to grow to over 8,000 MW by 2025.").

[74] A.B. 3723, 217th Legislature (2018) (increasing the total RPS requirement in New Jersey to 35% by 2025 and 50% by 2030). Prior to this legislation, New Jersey's RPS had required only 24.5% renewable energy by 2020, so the recent act represents a major expansion that will drive significant renewable energy development in the PJM region.

[75] PJM Initial Comments, at 12 (noting that only wind and demand response performed optimally during the 2014 Polar Vortex).

[76] *See* Paul Peterson, Doug Hurley, & Pat Knight, *Understanding ISO New England's Operational Fuel Security Analysis* (May 3, 2018), https://www.clf.org/wp-content/uploads/2018/05/Understanding-ISO-NE-OFSA1.pdf, at i ("[T]he reliability of the regional grid increases in direct proportion to the amount of renewable and clean resources added by state policies").

d. Concerns regarding PJM's disruption simulations

PJM describes a range of disruptions to fuel delivery systems that it will simulate. For the baseline, "no disruption" PJM assumes current pipeline capacity. Given the lack of information about the timeframe for PJM's analysis it is difficult to assess whether this assumption is reasonable, but if the analysis timeframe is at least a few years out, assuming today's pipeline capacity likely underestimates future availability, whether it be due to pipeline development,[77] reduced usage by local gas utilities, or new gas contracting mechanisms that provide greater transparency regarding pipeline capacity.[78]

Insofar as PJM continues to invest its stakeholders' time in a fuel security analysis, we support PJM's effort to evaluate non-gas fuel supply disruptions. Coal deliveries by rail and barge are subject to bottlenecks and disruption based on extreme weather.[79] With respect to coal, PJM should broaden its assessment to look not only at supply disruptions, but also whether on-site fuel is practically available. As PJM explained in its recent Cold Snap Performance Report, coal supply issues can sometimes be reported as "coal quality issues" which mostly refers to coal freezing as it is conveyed from the pile to the boiler.[80] During winter storms, coal piles and conveyor belts have frozen and become inaccessible to operators.[81] Assessing fuel deliverability

[77] For example, the Atlantic Sunrise and PennEast pipelines, both of which flow through PJM, are major pipeline projects that remain under construction. *See, e.g.*, Atlantic Sunrise, http://atlanticsunriseexpansion.com/ (last accessed June 5, 2018); PennEast Pipeline, http://penneastpipeline.com/ (last accessed June 5, 2018). This does not include projects that may be in the preliminary planning stages.

[78] PJM has recently requested FERC "to encourage the development of additional pipeline services tailored to the flexibility needs of natural gas-fired generation so as to encourage appropriate tailoring and pricing of services beyond today's traditional firm/interruptible paradigm." Comments and Responses of PJM Interconnection, L.L.C., Docket No. AD18-7 at 58-69 (March 9, 2018). Delineating and pricing a shaped flow non-ratable service would have numerous operational, transparency, and reliability benefits. For a further discussion of the merits of non-ratable services, see Reply Comments of the Environmental Defense Fund, Docket No. AD18-7 (May 9, 2018).

[79] *See generally* Coal Delivery Issues for Electric Generation, FERC (Dec. 18, 2014), https://www.ferc.gov/media/headlines/2014/2014-4/A-3-presentation-staff.pdf; *see also* Cold Snap Performance Report at 16 ("Data obtained through generator outreach indicates that about 28 percent of combined coal and oil units (by ICAP MW) with on-site fuel inventories reported issues with fuel resupply due to fuel transportation constraints. For coal-fired units, the most frequently reported transportation issues were barge resupply delays due to frozen rivers and increased barge traffic.").

[80] Cold Snap Performance Report at 16.

[81] *See Staff Report to the Secretary on Electricity Markets and Reliability* at 98, DOE (Aug. 2017), https://www.energy.gov/sites/prod/files/2017/08/f36/Staff%20Report%20on%20Electricity%20

is only part of the question as to whether the fuel is practically available. Of course, fuel availability is itself only one factor in whether a generator is available when needed most—non-fuel related operational issues make up a substantial portion of winter forced outages.[82]

5. Process

PJM offers no reason why its proposed modifications to RPM need to be implemented in time for the 2019 Base Residual Auction. Numerous recent comments from PJM attest to the absence of any emergency relating to fuel security.[83]

The process that PJM describes is complex and best undertaken (if at all) in iterative fashion with the opportunity for stakeholders to provide input at various stages of the analysis. As PJM describes the process, these comments are the sole opportunity for input prior to the study becoming final. Given the many unanswered questions about the analytical approach (see above), this is inadequate for PJM to receive the input and vigorous discussion needed to ensure that the study provides the most accurate information possible. Although PJM envisions "[w]orking through the PJM stakeholder process" to incorporate the identified vulnerabilities as

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Markets%20and%20Reliability_0.pdf ("Many coal plants could not operate due to conveyor belts and coal piles freezing"); *id.* at 11–12 ("[w]hile coal facilities typically store enough fuel onsite to last for 30 days or more, extreme cold can lead to frozen fuel stockpiles and disruption in train deliveries.").

[82] Cold Snap Performance Report at 18–19 (outlining a chart showing that source such as boiler system and unit trip failures account for a significant portion of forced outages); *Analysis of Operational Events and Market Impacts During the January 2014 Cold Weather Events*, PJM (May 8, 2014), 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 (noting that only a quarter of the record high 22 percent forced outage rate on Jan. 7, 2014 during the Polar Vortex was the result of fuel supply issues and that were other causes such as faulty plant maintenance and weather-related damage, were far more significant). *See also* Comments of Public Interest Organizations at 28 (Oct. 27, 2017), FERC Docket RM18-1.

[83] *See, e.g.*, Comments of PJM Interconnection, L.L.C. at 4 (Mar. 9, 2018), FERC Docket AD18-7 ("To be clear, the PJM [Bulk Electric System] is safe and reliable today – it has been designed and is operated to meet all applicable reliability standards."); News Release, *PJM Statement on Potential Development of Energy Market Intervention* at 1 (June 1, 2018), http://www.pjm.com/-/media/about-pjm/newsroom/2018-releases/20180601-pjm-statement-on-potential-doe-market-intervention.ashx ("Our analysis of the recently announced planned deactivations of certain nuclear plants has determined that there is no immediate threat to system reliability."); Letter from Vincent P. Duane, Senior VP, General Counsel, PJM, to the Honorable James Richard Perry (Mar. 30, 2018) (in responding to FirstEnergy Solutions' request for DOE to find a grid emergency, "PJM can state without reservation there is no immediate threat to system reliability.").

constraints in RPM,[84] there is no equivalent process for stakeholders to question the vulnerabilities that may be identified by the study.

PJM's proposed implementation timeframe does not specifically address time needed for FERC approval of any changes to RPM. Even assuming some overlap in Phases 1 and 2, PJM could likely not prepare a Section 205 filing earlier than February 2019, which would leave only three months for protests and consideration by FERC. For such an important matter with complex interactions with other barely implemented and pending changes to RPM, more time is essential.

In conclusion, we request that PJM reconsider its decision to prioritize fuel security analysis at this time, as doing so diverts PJM and stakeholder resources from other, more cost-effective measures that could be taken to reduce customer outages. Should PJM continue with the proposed fuel security analysis, it must clarify and revise certain assumptions as described above, and allow stakeholders further opportunities for input on the analytical process.

Sincerely,

Casey Roberts
Sierra Club

Gillian Giannetti and Jennifer Chen
Sustainable FERC Project and Natural Resources Defense Council

Kim Smaczniak
Earthjustice

Michael Panfil
Environmental Defense Fund

[84] VFS at 3.