

Comments of the American Petroleum Institute

PJM's Valuing Fuel Security Initiative

The American Petroleum Institute (“API”) is a national trade association representing over 625-member companies involved in all aspects of the oil and natural gas industry. API’s members include producers, refiners, suppliers, pipeline operators, and marine transporters, as well as service and supply companies that support all segments of the industry. Additionally, some API members are also the owners and operators of gas-fired merchant power generation in wholesale markets across the United States. API advances its market development priorities by working with industry, government, and customer stakeholders to promote increased demand for and continued availability of our nation’s clean, abundant natural gas resources for a cleaner and more secure energy future. Ensuring the reliability of the grid during high impact events is a priority for our members who are both producers and consumers of clean-burning natural gas and electricity. Likewise, it is critical that the market rules do not hinder natural gas generators’ ability to participate in providing electricity to over 65 million people in the PJM region. Therefore, API has an interest in ensuring wholesale electricity market rules and regulations treat natural gas generation equitably, providing a non-discriminatory level playing field for all resource types.

1. Natural gas has continuously proven to be a reliable, resilient and secure source of fuel within the PJM region and the country. The natural gas pipeline infrastructure is reliable because of its unique physical operations, ability to reliably deliver natural gas to its customers, and market practices that allow the entire electric system to work.
2. The natural gas system is also extremely robust, especially within the PJM region because of the Marcellus and Utica shales. There are more than a half million wells across 30 states producing natural gas which minimizes the impact of weather events on offshore facilities.

Ten of these 30 states are in the PJM region¹ which makes the natural gas system a critical component in ensuring that customers throughout the region are served. This geographic diversity of supply enhances the reliability of the natural gas system to deliver resources in accordance with the terms of supply contracts.

3. As demand from the power sector grows, natural gas is expected to remain the primary fuel source for electricity generation within the PJM region. This is partially due to natural gas's low cost and abundant supply, but also because of the flexibility that will be required as more intermittent resources enter the market. Additionally, natural gas simultaneously provides lower-carbon emissions and environmental benefits.
4. PJM defines fuel security as "risk in fuel delivery to critical generators."² While aiming to ensure generators have fuel during critical situations, it is important that PJM recognize the variety of ways that fuel security could be jeopardized such as severe weather events or other unusual phenomena.³ Fortunately, the natural gas system has a design that ensures that it can operate in a reliable and resilient fashion under most circumstances. The physical operation of the natural gas industry - from production to transmission to distribution - make the system inherently reliable and resilient. Due to the large number of producing wells, widespread natural gas storage, a transmission system that can operate at high pressure even when there are multiple compressor failures, and a distribution network that can run unattended and without power or manually in the event of a disruption to automated

¹ See U.S. Crude Oil and Natural Gas Proven Reserves, Year-end 2016 available at <https://www.eia.gov/naturalgas/crudeoilreserves/>

² See Update on Fuel Security Initiative at 6, June 28, 2018 available at <http://www.pjm.com/-/media/committees-groups/committees/mrc/20180628-special/20180628-fuel-security-analysis-approach-assumptions.ashx>.

³ According to the EIA, most outages are not caused by a loss of electric supply. Between 2012-2016, 96% of the 3.4 billion customers who were impacted by major electricity disruptions were victims of severe weather. <https://rhg.com/research/electric-system-reliability-no-clear-link-to-coal-and-nuclear/>

systems, disruptions to natural gas service are rare.⁴ These unique attributes of the natural gas system also decreases the likelihood of cascading effects resulting from a disruption in the supply chain. Instead, the natural gas system is designed to be flexible and independent resulting in isolated incidents.⁵

5. The inability of a generator to receive natural gas is a rare area of concern due to the sophistication and preventative design of the natural gas pipeline system and the changes in the capacity market that ensure demand is met throughout the year. The physical flow of natural gas makes it extremely manageable in the case of a disruption. Natural gas physically moves through a pipeline at a relatively slow pace; as a result, it is easy for a pipeline operator to control the slow-flowing gas in the case of an unlikely event of disruption. Therefore, a failure at a single point in the transportation system typically has only a localized effect. This is beneficial to customers because the product remains deliverable even if there is an isolated incident.⁶ While incidents are still bound to happen, the mechanics of natural gas pipelines allow operators to redirect or adjust the gas flow in the case of an occurrence.⁷ The natural gas transportation network is composed of an extensive network of interconnected pipelines that offer multiple pathways for rerouting

⁴ Massachusetts Institute of Technology, Lincoln Laboratory, “Interdependence of the Electricity Generation System and the Natural Gas System and Implications for Energy Security,” May 15, 2013.

⁵ Zimmerman, Rae and Restrepo, Carlos E., Analyzing Cascading Effects within Infrastructure Sectors for Consequence Reduction, available at https://research.create.usc.edu/cgi/viewcontent.cgi?referer=https://www.bing.com/&httpsredir=1&article=1146&context=nonpublished_reports.

⁶ More detail about the physical, operational characteristics of the natural industry segments can be found in the Appendices to the 2011 Southwest Cold Weather Event report prepared by the staffs of FERC and NERC. Report on Outages and Curtailments During Southwest Cold Weather Event of February 1-5, 2011 (August 2011), Appendices 8-10 (“Southwest Cold Weather Report”).

⁷ Id.

deliveries in the unlikely event of a physical disruption.⁸ So, if a pipeline were to suffer a service disruption, pipelines that interconnect will cooperate to support each other in the event of an outage.⁹

6. The creation of the Reliability Pricing Market, which enable generators to purchase natural gas on firm contracts, increased the reliability of natural gas. Firm transportation allows for large-volume customers to obtain uninterrupted service even when performance is required at unprecedented levels.¹⁰ Likewise, improved performance is an economic incentive for producers and many techniques are in place to help ensure that operations continue or that any disruption is minimized when a problem arises.
7. PJM specifically notes how beneficial natural gas storage is because it allows gas pipeline owners, marketers, local distribution companies and consumers to meet variations in gas demands, particularly in the case of an outage.¹¹ This unique ability to be stored after production, underground, and above ground in tanks as liquified natural gas or as compressed natural gas for industrial and commercial use is one of the many reasons why PJM and others have highlight natural gas as such an important fuel source. Just over half of all natural gas storage in the United States is within the PJM footprint; specifically, in western Pennsylvania, West Virginia and eastern Ohio.¹² So, while this does not cover

⁸ Natural Gas Systems: Reliable & Resilient, American Gas Association https://www.aga.org/sites/default/files/ngc_reliable_resilient_nat_gas_white_paper.pdf.

⁹ Id.

¹⁰ EIA, Market Digest: Natural Gas (2013-2014), https://www.eia.gov/naturalgas/review/winterlookback/2013/#tabs_Consumption-4.

¹¹ See Gas/Electric Industry Coordination, PJM LEARNING CENTER - CAPACITY MARKET (RPM), <https://learn.pjm.com/three-priorities/keeping-the-lights-on/gas-electric-industry.aspx>.

¹² Id.

every state within PJM, the ample and flexible pipeline network in the region allows pipeline pressures to be managed such that the benefit of the storage can be spread to the entire PJM footprint.

8. If PJM wants to properly evaluate how natural gas performs during severe weather events, it should base its assessment on actual and historical occurrences, not unrealistic hypotheses. PJM should also consider how capacity performance and transportation contracts affect the ability to obtain enough fuel to meet demand during peak times. Historically, most weather events do occur within a 10-14-day period, but the capacity market was redesigned in 2016 as a response to the 2014 Polar Vortex to give all generators an opportunity to prepare for any length of cold snaps, hurricanes and heat waves.¹³ Changes in the capacity market have made it more manageable for generators to enter into firm transportation contracts and meet power obligations on any given day of the year. These changes have also incentivized new efficient generation of all fuel types, natural gas in particular, while retaining existing generation that is needed to serve the electric needs of all PJM customers. The resilience of natural gas systems is also unique because of the producers' ability to increase production in the unlikely event of a disruption.¹⁴ As a result, the vulnerability of the supply to localized weather events has significantly decreased. For example, during the 2017-2018 cold snap PJM experienced numerous outages across the region; but there was a significant decrease of outages in comparison to the 2014 polar

¹³ Strengthening Reliability: An Analysis of Capacity Performance, PJM Interconnection, June 20, 2018 available at <file:///C:/Users/cadorezx/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/4H3J962S/20180620-capacity-performance-analysis.pdf>

¹⁴ Additionally, most natural gas production now occurs onshore, with offshore production making up only 5 percent of total natural gas production, Natural Gas Systems: Reliable & Resilient, Natural Gas Council, July 2017 https://www.aga.org/sites/default/files/ngc_reliable_resilient_nat_gas_white_paper.pdf

vortex.¹⁵ While natural gas-related outages were 58% of the total forced outages in PJM during the 2017-2018 cold snap, this percentage was still a significant decrease from 2014.¹⁶ Additionally, 100% of firm customers received their supply in spite of the number of forced outages. Therefore, the natural gas outages that occurred were not due to deliverability, supply or system issues, but were a direct result of non-firm transportation contracts.¹⁷ These changes in the wholesale power markets coupled with the fact that much of the natural gas system is underground, make it uniquely resistant to extreme weather and contribute to why natural gas continues to perform well.

9. When evaluating fuel security within the entire electric system, PJM should support efforts to increase the amount of pipeline infrastructure within the region and enhance the supply that is coming from the Marcellus and Utica Shales. The existing and planned natural gas pipeline infrastructure has already been concluded to be adequate for current and future anticipated electric system needs.¹⁸ These efforts include pipeline siting reforms and collaboration with FERC to ensure that pipelines and pipeline capacity is more accessible to the growing demands of residential, commercial and industrial customers; without

¹⁵ Total forced outages on Jan. 7, 2014 were 40,200 MW, 22% of PJM's total capacity, with 9,700 MW from gas plant outages and 9,300 MW from gas supply outages. On Jan. 7, 2018, total forced outages in PJM were 23,751 MW, 12.1% of total PJM capacity, with 8,096 MW from gas plant outages and 5,913 MW from gas supply outages. Coal outages were also down significantly, falling from 13,700 MW in 2014 to 6,935 MW in 2018. PJM does not contribute these numbers to the loss of a few larger units, instead it is a result of a diverse combination of full outages and partial reductions across many generators. PJM Cold Snap Performance, Dec. 28, 2017 to Jan. 7, 2018, PJM Interconnection, Feb. 26, 2018 available at <http://www.pjm.com/-/media/library/reports-notice/weather-related/20180226-january-2018-cold-weather-event-report.ashx>.

¹⁶ Id.

¹⁷ Id. at 13-17.

¹⁸ U.S. Department of Energy Report: Natural Gas Infrastructure Implications of Increased Demand from the Electric Power Sector, https://energy.gov/sites/prod/files/2015/02/f19/DOE%20Report%20Natural%20Gas%20Infrastructure%20V_02-02.pdf

ignoring the pipelines that are connected to underground storage units and are critical during emergencies. While the current pipeline system within PJM is sufficiently meeting the demands of customers, improving this system increases customers' access to affordable and reliable natural gas.¹⁹

10. The current resource profile in PJM is more reliable and diverse than it has ever been. PJM's current fuel mix has a balanced portfolio that includes natural gas, coal, nuclear, renewables, demand response and other resource types (i.e. fuel diversity). Subsequently, the PJM region has survived multiple winters due to this diverse fuel mix. The deep reserves of natural gas, coal and other fuel sources were critical to the reliability of PJM's grid during the 2017-2018 winter months.²⁰ While natural gas remains the leading fuel for generation within the region, PJM should continue to acknowledge this increase in fuel diversity, especially since the redesign of the capacity market.²¹ This fuel mix will continue to evolve in the coming years due to PJMs ability to develop timely response to ensure the continued reliable operation of the grid.

11. The current series of allegations from some parties that natural gas pipelines are increasingly and uniquely vulnerable to cyber-attacks is not based on evidence and has not been substantiated. In fact, the natural gas industry has worked with the U.S. government for years on cybersecurity defense of this nation's critical energy infrastructure. Natural

¹⁹Walton, Robert, PJM, ISO-NE: Gas Pipeline Opposition Could Put Power Reliability at Risk; Oct. 27, 2016 available at <https://www.utilitydive.com/news/pjm-iso-ne-gas-pipeline-opposition-could-put-power-reliability-at-risk/429160/>.

²⁰ Hannah Northey, Peter Behr & E&E News, GRID: PJM weathered cold snap and policy storm HYDROPOWER: Canada has too much clean electricity. Anybody want it? -- Thursday, September 21, 2017, <https://www.eenews.net/stories/1060070451>.

²¹ PJM Cold Snap Performance Id. at 2; <http://www.pjm.com/~media/library/reports-notice/special-reports/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx>.

gas pipeline operators – many of whom are members of Information Sharing and Analysis Centers (ISACs) – share cyber threat indicators with each other and back-and-forth with the US Department of Homeland Security, with reach back to the US Government Intelligence Community. The information sharing between natural gas pipeline operators and the US Government through ISACs includes regular classified and unclassified cyber threat briefings. Private sector operators of natural gas pipelines therefore receive cyber threat information from each other and the US Government and calibrate their cybersecurity programs to address these threats.²²

12. Meanwhile, the natural gas industry is continuously improving the tools it uses to ensure the prevention, detection and mitigation of cyberthreats. Most, if not all, of the largest natural gas companies manage cybersecurity as an enterprise risk, the highest designation, with oversight from Boards of Directors and Senior Executives. Natural gas companies widely orient their cybersecurity programs around the NIST Cybersecurity Framework. Natural gas companies' cybersecurity programs feature defense-in-depth, spanning network security identity and access management, data protection, application security, endpoint security, vulnerability management, threat protection, risk and compliance, and forensics and insider risk management. Natural gas companies are continuously responding to threats and evolving the sophistication of their cybersecurity, including to protect the use of automated controls – or industrial control systems (ICS) – for pipelines. The ISA/IEC 62443 Series of Standards on Industrial Automation and Control Systems (IACS)

²² On June 14, 2018, the Department of Energy convened a briefing for the executive leadership and cybersecurity experts from the American Petroleum Institute (API), the American Gas Association (AGA), the Oil and Natural Gas Information Sharing and Analysis Center (ONG-ISAC), the Downstream Natural Gas Information Sharing and Analysis Center (DNG-ISAC) and natural gas and oil companies that operate natural gas pipelines. The threats shared by the briefers from the US Intelligence Community at this briefing were already known to the natural gas industry representatives and had already been incorporated into the cybersecurity programs of companies in the natural gas sector.

Security (which are also referenced often in the NIST Cybersecurity Framework) have been adopted widely by natural gas companies. In addition, the natural gas industry participates in several information sharing and analysis centers, briefings and workshops to discuss security concerns, regular situational simulation training exercises that present real-world challenges and partnerships with the federal government on cybersecurity frameworks and initiatives.²³ As a result, service disruptions are rare and there is low risk of an uncontrollable or cascading effect within the system.²⁴

13. Additionally, cyber threats are not a unique trait of the natural gas industry; coal and nuclear facilities also face an increasing number of threats. Reports from as recently as March 2018 highlight the U.S. government's growing concern of the vulnerability of nuclear power plants by Russian actors.²⁵ Meanwhile, "fuel secure" coal plants remain susceptible to hackers and physical attacks; and disturbingly, the state of cyber readiness at thousands of coal generating units across the nation is largely unknown to the federal government.²⁶ The increasing number and severity of cyber threats to natural gas pipelines does not equate to higher vulnerability because companies operating these pipelines are continuously responding to threats and evolving the sophistication of their defenses, in collaboration with the US Government.

²³ Id.

²⁴ Natural Gas Systems: Reliability and Resilience available at <http://martelli.us/ngcouncil/wp-content/uploads/2018/03/Fact-Sheet-Natural-Gas-Systems-Reliable-Resilient.pdf>.

²⁵ Nicole Perloth & David E. Sanger, Cyberattacks Put Russian Fingers on the Switch at Power Plants, U.S. Says, The New York Times (2018), <https://www.nytimes.com/2018/03/15/us/politics/russia-cyberattacks.html>.

²⁶ Blake Sobczak, Coal Plants' Vulnerabilities are Largely Unknown to Feds, E&E News (2018), <https://www.eenews.net/stories/1060086303>.

14. It is clear that every industry is vulnerable to cyberattacks, but fortunately a cyberattack is not known to have ever disrupted the flow of natural gas or electricity anywhere in the U.S.²⁷ PJM should continue to work with the natural gas industry to properly evaluate and access the cyber threats that face not only natural gas systems, but the entire PJM power sector.
15. Fuel security and reliability require not only physical resilience, critical infrastructure and the ability to withstand cyber-attacks, but a collaboration between all participants within the power sector to ultimately ensure that customers continue to benefit from the reliability of the natural gas system. This requires customers to take advantage of the redesigned capacity markets and for PJM to create policies that allow all fuel types to compete fairly. When accessing fuel security, PJM should use a holistic approach to better appreciate and understand the supply chain of one its most critical inputs.

²⁷ Id.