



Testimony of Mike Bryson, Senior Vice President – Operations

Technical Conference Regarding Impacts of COVID-19 on the Energy Industry

June 30, 2020

For Public Use

Introduction:

As PJM's senior vice president of Operations, I am responsible for PJM's Operations Division, including 24/7 transmission operations for real-time systems, as well as the engineering analysis required to run the system and support the critical energy management systems.

I am pleased to provide this opening statement to briefly outline how PJM Operations and the larger PJM community have managed through operating challenges brought on by the COVID-19 pandemic.

Although the spread of the virus was certainly not foreseeable, planning and operating through a pandemic was not a totally new subject in PJM. In 2009, Tom Bowe, one of PJM's senior executives involved in Operations, participated extensively in the drafting of a NERC report¹ which was designed to provide guidance to the industry in planning and operating during a pandemic.

Beginning in early 2020, as news of impacts of the virus affecting the U.S. emerged, PJM activated its Incident Response Team; implemented its Pandemic Plan; and began to take steps to mitigate potential risks to employees including restricted business travel, restricted campus visitors, restricted Control Center access, and enhanced cleaning measures throughout PJM campuses. Beginning in Mid-March, PJM took additional measures including canceling all travel and face-to-face meetings, including stakeholder meetings while maintaining strong stakeholder interaction through Webex meetings and conference calls. In addition, PJM staff moved almost entirely to a work-from-home posture as PJM shift operators moved to an aggressive isolation between the two campus Control Centers, including moving to 12-hour shifts and contactless shift turnover.

As the COVID-19 pandemic began having a greater impact on regions within PJM's footprint, PJM expanded communication efforts with its members, this commission, state commissions and the public to share the impact of the pandemic on PJM, and for PJM to clearly understand the impact of the pandemic on its members. PJM began holding weekly sessions during which PJM could share information with its members and respond to questions in a public forum. In addition to these meetings, PJM created a forum to serve as a weekly venue where member company operators would feel more comfortable sharing details that they might be unwilling to share more openly. PJM also held weekly meetings with the Commission's Pandemic Response Team, as well as with the state commissions, and incorporated that feedback into its analysis as well. Having these meetings helped PJM quickly communicate the information it was gathering, and also identified and prioritized issues effecting its members. These meetings and the one-on-one forum also helped inform PJM steps by learning from member company approaches to the pandemic. During this time, PJM also coordinated closely with IRC members – also learning valuable approaches to pandemic operations.

¹ *High-Impact, Low-Frequency Event Risk to the North American Bulk Power System*, North American Electric Reliability Commission, June 2010.

https://www.nerc.com/pa/Stand/Geomagnetic%20Disturbance%20Resources%20DL/HILF_112012.pdf#search=High%20Impact%20Low%20Frequency%20Risk%20AND%20JUNE%202010%20%20%202010

Our initial focus for system operations was to develop approaches to mitigate potential impacts to PJM member companies and PJM staff – either directly to protect employees or indirectly to protect supply chains. PJM worked closely with PJM stakeholders, including state regulators, to identify and mitigate impacts to resources such as potential curfews and road closures. PJM also provided liaisons to multiple ESCC working groups to develop industry best practices to various COVID operations.

In addition, PJM took more targeted actions with system operations, which included splitting staff between Control Center campuses; eliminating all access to control rooms except for dispatchers; moving to 12-hour shifts to reduce potential for spread; shifting turnover to dispatchers at an adjacent Control Center; establishing a third control room; testing and sequestering dispatchers. We also established a bench operator effort which established a formal identification and training effort to backup shift operators based on specific reliability tasks. We had an epidemiologist review our plans at each step. We have also been engaged in international industry groups to capture lessons learned and best practices from other similar companies around the globe.

PJM has developed a robust return-to-campus plan, which is conservative and flexible. For the most part, staff will continue to telecommute through the summer and then transition staff back to our campuses. For Operations, we have developed processes that could be used to bring some critical support staff back to campus to assist with critical operating periods. Basically, operationally we are going to step out of our pandemic posture, more or less using the same step-by-step approach that we used to enter into our pandemic response posture, albeit in the opposite direction. All of these plans include steps to quickly return to full pre-pandemic operations.

General PJM Generation Information Section:

PJM has 186,788 MW of total generating capacity.

The typical generation outage levels in the PJM footprint are seasonally dependent. During the summer and winter months, when demand is much higher and outage are more restricted, outages levels typically range from 5,000 MW to 10,000 MW. However, during the spring and fall months, which are the traditional outage seasons for the generators, outage levels can reach peaks between 50,000 MW and 60,000 MW.

Overview of PJM Generation Outage Process

PJM ensures that there is adequate generation to serve load and meet various operational requirements. PJM's outage system, eDART², tracks the availability of every generator in the PJM region, as well as the projection of near- and long-term load forecasts. This information is used to calculate the remaining generator outage margin.

Both of these tools are used in PJM's approval process for generator Planned and Maintenance outages. Outage requests starting within the next seven days are evaluated using this system, which calculates generator outage

² eDART (Dispatcher Application and Reporting Tool) allows generation and transmission owners to submit generation and transmission outage requests. eDART allows its users to manage their outage data by viewing the status of their outages and obtaining outage reports. <https://www.pjm.com/markets-and-operations/etools/edart.aspx>

margins using the near-term load forecast. Outages that are longer than seven days, or are scheduled to start seven+ days out, are evaluated using the long-term load forecast.

PJM Generation Outage Coordination Actions in Response to COVID-19

Generation Resource Owner Communication:

In addition to these regular meetings, PJM issued an open survey to its generation resource owners to collect detailed information from them on the impacts of the COVID-19 pandemic on a company and a unit level. The survey collected information ranging from the actual impact to the member workforces, to mitigation and risk management best practices, to outage impacts due to the pandemic. This survey was opened to members in March 2020 and has remained open for members to update their responses to provide PJM an evolving view of the pandemic on the generators within its footprint. To monitor the data coming in, PJM built a real-time dashboard to display the data collected from this survey which provided both a high-level view of the data in aggregate, and also the details down to the unit level. This dashboard was available internally to inform decision-making, outreach and technical analysis.

PJM COVID-19 Severe Generator Plant Staff Impact Analysis:

Due to the unknown duration and impact of the COVID-19 pandemic on generator plant staff, PJM performed several worst-case generator unavailability scenario studies to assess the potential impact of generator outages during spring and summer peak loads. PJM developed outage scenarios based on large concentrations of generation located near COVID-19 hotspots within the PJM footprint. The results³ of the analysis indicated that unprecedented amounts of generation unavailability would need to be concentrated in one area – prior to severe, uncontrollable issues developing – that would need to be mitigated by dropping load.

MOC Remote Operations:

PJM provided market participants with guidance⁴ on how to conduct MOC remote operations as a last resort. This was developed along with PJM member feedback to address questions raised by market participants who identified the possibility of having to move some or all of their control center operations to one or more non-traditional remote locations.

³ PJM COVID 19 Generator Availability Analysis, May 8, 2020. <https://pjm.com/-/media/committees-groups/pandemic/postings/covid-19-gen-availability-analysis-presentation.ashx?la=en>

⁴ PJM Manual 1, Attachment F. <https://www.pjm.com/~media/documents/manuals/m01.ashx>

Gas-Electric Coordination:

In late March, PJM, through the ISO RTO Council Electric Gas Coordination Task Force (IRC EGCTF), initiated a biweekly conference call to identify best practices associated with COVID-19 operational response efforts across the electric and gas industries. Participants on these calls include:

- ISOs and RTOs that comprise the IRC EGCTF
- The Interstate Natural Gas Association of America (INGAA)
 - The interstate pipelines represented by INGAA
- The Natural Gas Supply Association (NGSA)

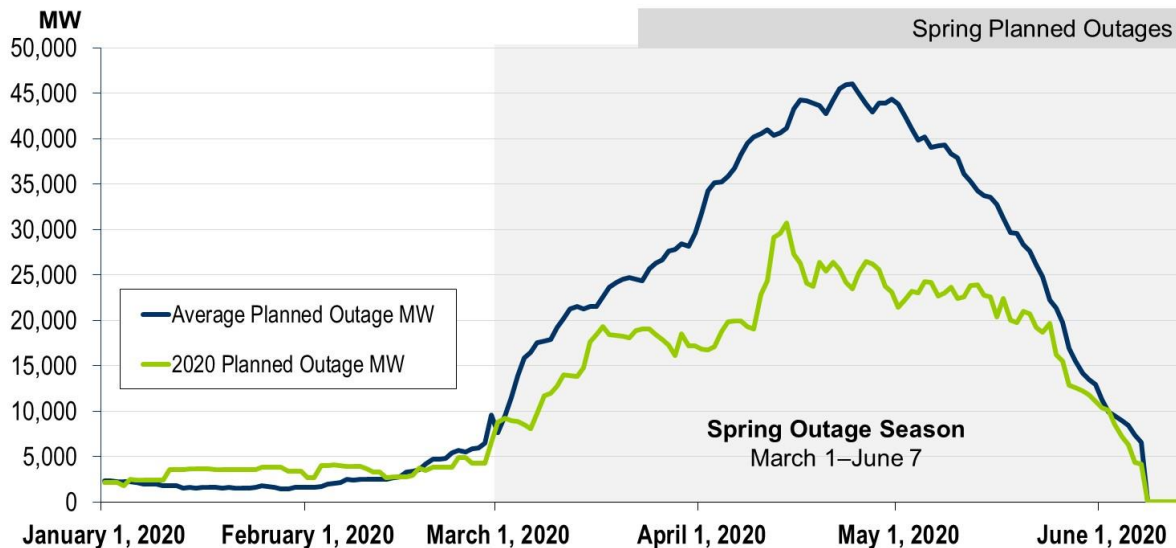
These calls are continuing as both industries begin to implement their return-to-work efforts through the summer and fall months, and opportunities to learn from each other's experiences remain.

COVID-19 Impact on Generation Planned and Maintenance Outages:

Throughout the period of the pandemic, neither generation nor transmission resources within the PJM footprint experienced any major or systemic issues. While isolated issues did appear to crop up, there were no impacts to operations or reliability.

PJM identified multiple outages that were at risk of delay, postponement or outright cancellation via the survey that was issued to generators, for a variety of pandemic-related reasons (local work restrictions, the reliance on contractors or equipment from outside of the state or U.S., concerns regarding availability and delivery of consumables, etc.). PJM also actively monitored the status of the planned and maintenance outage tickets throughout the height of the pandemic. While the number of outages remained consistent with pre-pandemic numbers, an after-the-fact review of the magnitude (on a megawatt basis) of the generator Planned Outages shows a clear reduction from the average spring outage season of the prior four years. This indicates that outages were still taking place, but many Planned Outages were reduced in scope and/or duration, making the 2020 spring Planned Outage numbers much lower.

Compared to the past four years (2016–2019), PJM saw impacts to both the generation planned and maintenance outage numbers taken during the 2020 spring outage season, which happened to largely coincide with the peak of the COVID-19 pandemic within PJM's footprint. For example, the magnitude of the Planned Outages this spring were, on average, over 10,000 MW lower on a daily basis, an average drop of 37 percent relative to the past four years (Figure 1: Planned Outage Megawatts – 2020 Versus Average).

Figure 1. **Planned Outage Megawatts – 2020 Versus Average**


Looking forward to the 2020 fall outage season, PJM anticipates potentially higher-than-average Planned Outages this year. As of June, the forecasted Planned Outage numbers for the fall outage season are already very close to the average Planned Outage amounts for fall outage seasons. Since PJM sees most Planned Outages scheduled 30- to 90-days prior to the start of the Planned Outage, we expect to see additional Planned Outages scheduled as we draw closer to the 2020 fall outage season, potentially exceeding the averages.

At this time, PJM does not anticipate difficulty in maintaining sufficient available generation while also allowing higher-than-average Planned Outages this fall. PJM uses an outage scheduling model to calculate the amount of outages that can be approved in mid/long-term outage scheduling, and even when estimated Maintenance Outages are added, PJM is generally below that model's threshold. A necessary amount of margin still exists in the case that additional outages from the 2020 spring outage season get rescheduled to this fall, and as those dates get closer and PJM switches to its near-term outage scheduling model, we expect even more margin for outages to become available.

In conclusion, even though PJM is currently forecasting an above-average amount of Planned Outages for the 2020 fall outage season, outage margins from the longer-term outage approval model still exist for additional outages this fall. We are still investigating with generation owners if they have additional outages needed for this fall that have yet to be scheduled, but again, PJM maintains adequate reserves in line with published Installed Reserve Margin value via the longer-term calculations and can recall/defer Maintenance Outages as needed.

COVID-19 Load Impacts and Changes

Starting in mid-March, the COVID-19 pandemic manifested itself in broad business shutdowns. This has resulted in significant changes in people's typical behaviors, and with it, a sizeable reduction in electricity demand. Much still remains to be learned, but some impacts and trends have become apparent.

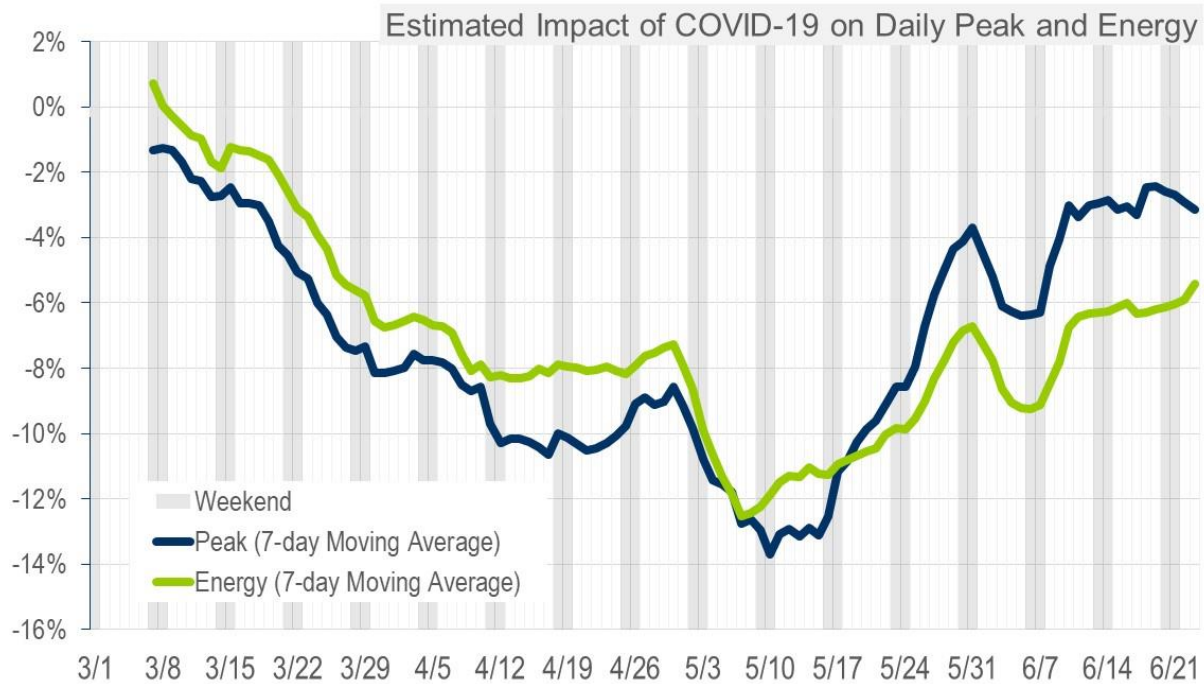
Prior to the pandemic, the share of RTO annual demand for each of the three customer sectors was: residential – 37 percent, commercial – 37 percent, and industrial – 26 percent. Each of these sectors has drastically different use profiles. Commercial and industrial customers have a large share of their demand driven by non-weather-sensitive end uses, while residential customers tend to be much more weather-sensitive. Although PJM does not have insight into specific sector impacts, it is clear the relative sector impacts do affect load conditions at the grid level. In addition to the economic impacts, the observations cited here PJM believes are in-part driven by a shifting of load from the commercial and industrial sectors to residential.

Intra-Day Effects

From an operational perspective, one of the first observations was a shift in morning load behavior. Winter and early and mid-spring days are often characterized by a double-hump hourly load pattern, where load ramps to a peak in the morning and then again in the evening. As stay-at-home orders started to materialize, PJM began to observe a later morning peak, with morning peaks occurring more in the 8–9 a.m. or 9–10 a.m. hours, rather than 7–8 a.m. Then, between the morning and evening peaks, the afternoon sag was less pronounced. With the onset of late spring and early summer, the morning impact is less apparent. This time of year tends to not have morning peaks, and the morning ramp has also generally been more moderate.

Daily Peak and Energy Impacts

COVID-19 began to have a noticeable impact on PJM load starting about mid-March and began to intensify starting around March 23 when many states' stay-at-home orders went into effect. The chart below depicts the seven-day moving average of the estimated COVID impact on daily peaks and energy demand. These estimates indicate that daily peak demand was around 8–10 percent lower than it otherwise would have been for much of April, with the drag accelerating to 12–14 percent for the first half of May. Over the same time period, the impact on energy has been less pronounced, buoyed by the previously mentioned smaller afternoon sag.

Figure 2. **Estimated Impact of COVID-19 on Daily Peak and Energy**


Since mid-May, peak impacts have decreased considerably, and energy impacts have as well to a lesser extent. The cause is twofold:

- **Increased Residential Demand** – The shift toward residential comprising a larger share of electricity demand results in greater weather sensitivity of PJM load. The onset of summer weather conditions, coupled with the increased weather response, is reducing the COVID impacts on load.
- **Resumed Commercial/Industrial Demand** – The rollback of some restrictions has lifted commercial and industrial demand.

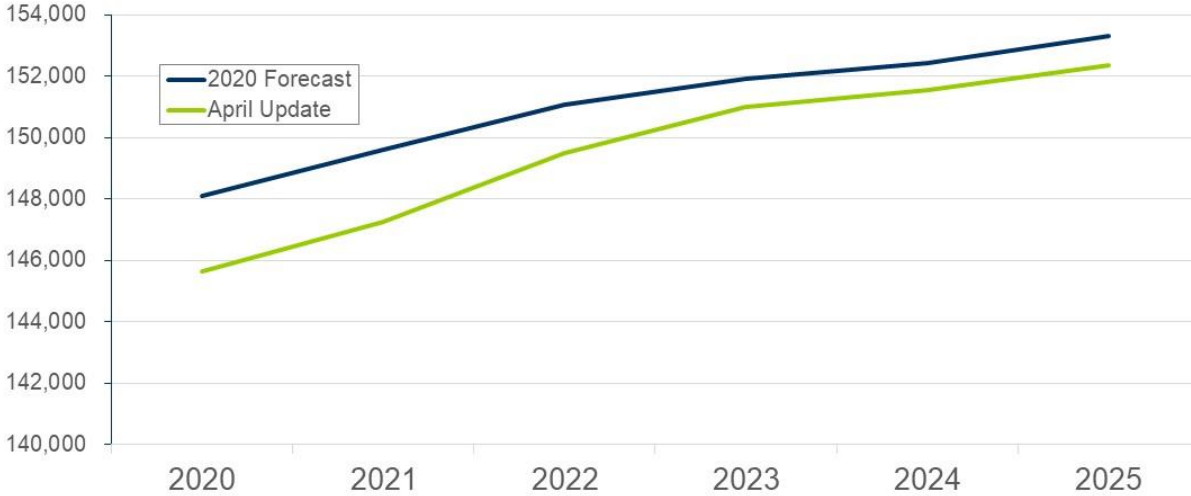
Our analysis seems to indicate that increased residential demand is the more dominant factor thus far, as this would be consistent with the more significant reduction in peak impacts than in energy impacts. Peak is more weather-sensitive than energy, and energy impacts have been now outpacing peak impacts since mid-May. As restrictions continue to ease, it is possible there will be some interplay between the two factors of increased residential demand and resumed commercial/industrial demand as eased restrictions may reduce residential cooling demand with people returning to work.

Load Forecast

PJM produced an updated long-term load forecast outside of its normal schedule to better reflect COVID-19 impacts. PJM was granted a waiver by FERC to use this forecast for the Second Incremental Capacity Auction for the

2021/2022 Delivery Year⁵. When compared to our pre-COVID forecast from January, 2020, this update showed a 1.6 percent reduction in our projected peak demand for summer 2021 (see graph below).

Figure 3. PJM RTO Summer Peak Forecast



	2020	2021	2022	2023	2024
April Update – Percent difference from 2020 Forecast	-1.7%	-1.6%	-1.0%	-0.6%	-0.6%

Cybersecurity Threats and Vulnerabilities

From PJM's view of the threat landscape, COVID brought increased phishing emails, with themes related to the pandemic. In addition to monitoring our existing defensive technologies to protect against phishing, PJM provided additional awareness messaging to end-users to help spot malicious email. PJM was able to maintain all of its normal cybersecurity operations remotely, including 24/7 security event monitoring, patch and vulnerability management, password management, and configuration monitoring. PJM continued to work with its government and commercial partners to get up-to-date cybersecurity threat intelligence information. In addition, PJM's remote access infrastructure was already prepared both for the capacity needed for remote operations and for the security configuration needed to protect PJM while in remote operation.

⁵ FERC Docket No. ER20-1870-000. <https://elibrary.ferc.gov/IDMWS/search/fercgensearch.asp>