Jack E. Jirak
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February 23, 2022

VIA ELECTRONIC FILING

Ms. A. Shonta Dunston, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

RE: Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's Response to Commission Questions
Docket Nos. M-100, Sub 163 and E-100, Sub 173

Dear Ms. Dunston:

Pursuant to the Commission's January 26, 2022 *Order Opening Investigation, Scheduling Technical Conferences, Requiring Responses, and Allowing Comments and Reply Comments,* enclosed for filing in the above-referenced docket is Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's Response to NCUC's January 26, 2022 Order Requiring Responses to Commission Questions.

If you have any questions, please do not hesitate to contact me. Thank you for your assistance with this matter.

Sincerely,

Jack E. Jirak

Enclosure

cc: Parties of Record

CERTIFICATE OF SERVICE

I certify that a copy of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's Response to NCUC's January 26, 2022 Order Requiring Responses to Commission Questions, in Docket Nos. M-100, Sub 163 and E-100, Sub 173, has been served by electronic mail, hand delivery, or by depositing a copy in the United States mail, postage prepaid, properly addressed to parties of record.

This the 23rd day of February, 2022.

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Questions for Electric Utilities

General:

1. What changes if any has your utility implemented due to lessons learned from the February 2021 outages in Texas and the South-Central U.S.?

Response:

In response to the February 2021 outages in Texas and the South-Central U.S. ("2021 Texas Event"), Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP") (collectively, "Duke Energy" or the "Company") leadership directed a review of the NERC document "Information Resources on Cold Weather Preparation and BPS Impacts" updated February 11, 2021, to recommend potential improvements. The review was completed and reviewed with operational leaders in April 2021. It concluded that Duke Energy's existing winter weather preparations across the Enterprise will minimize the effects of cold weather on our system. Below is a summary of certain key improvements that have resulted from Duke Energy's review of the 2021 Texas Event and the NERC document:

1. Currently, Duke Energy's Transmission Department leaders conduct an annual multi-discipline winter preparedness review, which includes other operational departments and is used to evaluate and update seasonal readiness. Following the 2021 Texas Event, certain additional participation and process steps for the preparedness review were implemented to strengthen the depth of evaluation of operational readiness of key systems. For example, the Company required business unit senior leaders to participate along with subject matter experts to provide additional leadership oversight of the review.
2. The 2021 Texas Event illustrated an extreme scenario in which a great number of factors, including the loss of generation, resulted in extended and widespread blackouts. Duke Energy reviewed its existing processes and procedures for demand-side management, rolling blackouts, generation black starts and cold-load pick up. A multi-disciplined drill to test these integrated responses to a large-scale event was conducted to identify, and correct any issues related to the execution of these vital functions. For example, the Company identified an opportunity to improve its public communications to ensure that they accurately describe the severity of a weather event. In addition, specific incident command and control learnings from that drill have been used to strengthen leadership awareness and understanding of the processes required to implement the General Load Reduction Program.
3. Gas supply shortages contributed to some of the generation loss during the 2021 Texas Event. Review of gas supply methods and systems at Duke Energy facilities was conducted. The Company identified no gaps for stations in the Carolinas.
4. Liquid fuel back-up capabilities at our existing natural gas plants were also evaluated. In response to the 2021 Texas Event, the Company established a specific requirement to test the operation of combustion turbine generators on liquid fuel prior to cold weather operations to ensure that liquid fuel can function as a backup source for these generators.

5. Finally, in response to the 2021 Texas Event, the Company reviewed its existing cold weather inspection procedures for exterior equipment at nuclear stations and strengthened guidance for inspections of backup diesel generator air intakes and certain facility supply fan intakes. These improvements are aimed at ensuring continued reliability for the Duke Energy system in the face of an extreme cold weather event.

2. What changes will your utility be making to comply with NERC's new cold weather preparedness standards that FERC approved August 24, 2021, and that take effect April 1, 2023?

Response:

To comply with NERC's new cold weather preparedness standards, Duke Energy will implement NERC Reliability Standards EOP-011-2, IRO-010-4, and TOP-003-5 (Standards) on or before April 1, 2023, per its ADMP-REG-TFP-00026, Enterprise NERC O&P Standard Assessment and Implementation Process ("SAIP") Governance Program document. The SAIP document establishes a framework and guidance for complying with NERC Operations and Planning Reliability Standards.

Many of NERC's cold weather preparedness requirements have already been implemented at Duke Energy in advance of the April 1, 2023 deadline, based on previous industry events and lessons learned. By way of example, Duke Energy will begin implementation of EOP-011-2 the winter of 2022/2023 to comply with the Initial Performance of Periodic Requirements for the annual inspection and maintenance of generating unit freeze protection measures under Requirement R7 Part 7.2 and the conduct of generating unit specific training for its maintenance and operations personnel under Requirement R8.

Weather and Load Forecasting:

3. Explain how your utility forecasts weather and/or acquires weather forecasts. Describe the frequency and robustness of the forecasts. Include information about whether the utility develops discrete forecasts for groups of power plants or parts of its service area.

Response:

Duke Energy has a NOAAPORT satellite system which receives a one-way broadcast of NOAA environmental data and information in near-real time. This is the same data being used by the National Weather Service to produce weather forecasts. Our internal systems process and analyze this data and our team of meteorologists use this data along with data provided by contracted vendors to produce a 15-day forecast of hourly weather parameters (e.g., temperature, dew point) for key locations across the Carolinas Service Area. These 15-day forecasts are produced each day (including weekends and holidays) and updated, as needed, throughout the day. Forecasts are then blended using a weighted average that is representative of each load base (e.g., Duke Energy Carolinas and Duke Energy Progress) and ingested into the load forecasting models.

In addition to the weather forecast inputs into the load model forecasts, Duke Energy Meteorologists provide power plant specific forecasts of precipitation amounts, severe weather, lightning alerts, and general weather. The plant-specific precipitation forecasts are produced daily and updated two times per day. The severe weather and lightning alerts are produced by an automated process only when those weather conditions are affecting each power plant. Additional power plant specific forecasts are requested infrequently. One example of a scenario that would trigger a plant-specific forecast is a hurricane threatening the North Carolina coastline. Under that circumstance, Brunswick Nuclear Plant would request a forecast of hourly sustained wind speeds and peak wind gust speeds for the duration of the event. This information would be updated every 6 hours.

4. Explain how, when extreme cold weather is forecasted, the utility forecasts customer load.

Response:

The Duke Energy Meteorology team is comprised of a team of experienced meteorologists that are trained in the weather patterns for the DEP and DEC balancing areas. The Meteorology team is available to coordinate with and provide information to the Reliability Coordinator ("RC"), Balancing Authority ("BA"), Transmission Owner ("TO"), Transmission Operator ("TOP"), Generator Owner ("GO"), Generator Operator ("GOP") load forecasting/unit commitment, power marketing and fuel trading functions regarding their preparedness and planning for extreme weather events in the near term horizon, generally between 0 and 14 days. The Meteorology team develops a daily weather forecast for each BA and updates its forecast multiple times a day. If the Meteorology team identifies an extreme cold event developing within the 7 to 14-day horizon, it will communicate with the functions outlined above and begin to incorporate the extreme weather event into the specific forecasts for each Duke Energy BA. Additionally, when an extreme event is forecasted within the near-term horizon, a tailgate meeting is established to bring together different personnel under the RC, BA, TO, TOP, GO, Load Forecasting/Unit Commitment, power marketing, fuel trading and Meteorology functions to discuss the forecasted event and the preparedness of the Duke Energy system.

While forecasting customer load during extreme weather events can be challenging, Duke Energy utilizes multiple third-party load forecasting models and various other tools available to its Load Forecasting/Unit Commitment analysts to plan for extreme weather event scenarios. These load forecasting models utilize both Duke Energy Meteorology BA specific weather forecasts as well as National Weather Service forecasts for our balancing authority areas that produce separate load models for those respective weather forecasts. Additionally, Duke Energy's Load Forecasting/Unit Commitment Analysts utilize automated tools that can generate forecasts based on historical loads during similar weather conditions for up to seven (7) years in the past. In addition, Duke Energy ran tests after the 2021 Texas Event to simulate how load models would fare in case of temperatures 10 degrees below the lowest recorded temperature over the last 30 years and both DEC and DEP BA load models indicated that such temperatures would not compromise the reliability of the system. As the models are forecasting for extreme scenarios where little or no prior data is available, the reasonableness check on the extreme forecast is based on extrapolation of the temperature response curve for winter conditions

Additionally, Duke Energy relies on our team members to utilize their experience and discretion to make adjustments to model output given that models and historical data may not entirely capture all of the factors impacting a real-time situation.

5. **For the last three winter peaks, how accurate were the Company's weather forecasts three days before the peak? The day before the peak? How accurate was the Company's load forecast three days before the peak? The day before the peak? Ultimately, how accurate was the peak load forecast?**

Response:

The table below presents Duke Energy's last three winter peaks and their associated percent accuracy for both weather and load forecasts three days before the peak and the day before the peak. The table demonstrates that, in general, Duke Energy's forecasts were very accurate. Forecasts are archived up to 6 days in advance of the day to which they apply. The Mean Absolute Percent Error ("MAPE") calculation for load forecast deviation from actual load is calculated for the forecast generated three days prior to the peak and one day prior to the peak. In the case of weather forecasts, the MAPE is replaced by the Celsius Absolute Percent Error ("CAPE") so it reflects only the temperature forecast deviation from actual temperature. The accuracy of the forecasts is therefore simply the difference between 100% accuracy and the percent error expressed by the MAPE or the CAPE (e.g., if the forecast error is 3% then accuracy is 97%).

Weather variables such as temperature deviation from forecast are closely coupled with load forecast accuracy. Additionally, load forecast models are regression time-series based models and rely on historical data to help predict future loads; as extreme weather events and peak days are "tail-events," which occur less frequently, there are not as many historical data points for those events from a regression basis, and as a result, modeling accuracy is less than weather-normal load days.

Peak Day Year	Day 1 (Weather)	Day 3 (Weather)	Day 1 (Load)	Day 3 (Load)
2019	98.6%	98.5%	96.7%	94.6%
2020	99.0%	99.2%	97.8%	98.3%
2021	99.3%	98.5%	97.4%	96.7%

6. **Are any changes contemplated to improve the accuracy of the Company's cold weather forecasts or winter peak load forecasts?**

Response:

Duke Meteorology is working with a data scientist to enhance user interfaces and risk visualization tools that will improve weather and load forecasting communications and decisions during extreme weather events. Meteorology continuously monitors all available weather model guidance and communicates not only our own forecasts but also any uncertainties that exist with that forecast. Communicating the uncertainty of the forecast is vital to the end-user to make better decisions knowing the alternatives. Currently, there is a national effort to improve weather modeling accuracy by improving the modeling inputs and components. These efforts include: 1) increasing computing capacity, 2) utilizing higher model resolution and improved physics, 3) improving data assimilation methodology and 4) incorporating new satellite observations into the weather models.

Power Plant Performance:

7. **During the last three winter peaks, what generating units were unable to operate due to the cold weather or weather-related fuel constraints, and what action has the utility taken to address the problem?**

Response:

To plan for extreme weather, the Companies' generating stations utilize each fall and spring, respectively, cold and hot weather preparedness checklists, which require, among other things, heat trace operational checks for cold weather and correct powerhouse ventilation for hot weather. As a result of executing our preventive efforts, Duke Energy is pleased to report that during the last three winter peaks, we did not have any coal, gas or hydro units that were unable to operate due to the cold weather or weather-related fuel constraints.

8. **Under what circumstances would the utility's gas-burning plants be subject to gas curtailment during extreme cold weather? How many megawatts of capacity are subject to this curtailment risk? How much of that capacity can use an alternate fuel, such as oil?**

For how long?

<u>Response</u>:

Duke Energy's gas-burning plants could be subject to gas curtailment during extreme cold weather if an upstream producer experiences freeze-offs at the well head during which freezing liquid can block the flow of gas. In this situation, gas supply may be cut and allocated during a scheduling cycle and not replaced by the shipper. Freezing can also impact critical interstate pipeline infrastructure affecting gas flow into Zone 5 which is allocated to the Company's CityGate. The Company has attempted to mitigate these potential supply disruptions by entering into contracts with Transco, the primary interstate pipeline serving the Carolinas, for 434,500 MMBtu/day of firm transportation service and the highest transportation priority. Additionally, the Company has agreements for firm supply from third-party suppliers as well as third-party storage. The Company also purchases incremental seasonal firm transportation capacity when available and economic. Duke Energy has had reliability discussions with Transco and recognizes, given reliance on third-party delivered gas, that under certain circumstances it could be subject to gas curtailment during extreme cold weather events. If such an event were to occur, Duke Energy would mitigate the projected curtailment by switching fuel from natural gas to fuel oil at available oil capable units.

The Company owns or contracts for approximately 17,700 MW of generation that can utilize natural gas. Of the approximately 17,700 MW, approximately 13,100 MW include owned and contracted for combined cycles, combustion turbines and coal facilities that are dual fuel capable and could run on coal or oil in the event of a gas curtailment that required the Company to switch from gas to these other fuels.

The Company has approximately 80 full load burn hours of fuel oil inventory or roughly three days available for generation with additional offsite inventory of 1.5 million gallons and multiple fuel oil agreements that would be utilized to deliver fuel oil. In the event of very high oil usage around the clock and across the fleet, the physical tank replenishment at the plants would be accomplished via fuel oil truck deliveries as part of delivered supply arrangements and reservation trucking arrangements that utilize off-site inventory. During prolonged peak usage, the replenishment rate is typically slower than the burn rate at the generating stations. For short durations, the Company can manage the system utilizing a significant amount of fuel oil and additional market power purchases.

9. During an extended cold weather period, one that lasts several days, how would solar and wind facilities likely perform? Would they present any special challenges?

<u>Response</u>:

Solar capacity factors and resulting energy output are limited during cold weather winter months and can have significant variability. In addition, during cold weather, energy from wind facilities can be reduced, as seen during the February 2021 Texas Event. Wind modelling shows that offshore wind profiles may be more consistent than onshore facilities during these types of events.

Based on the Figures 6 - 11, shown below from EIA.gov, for January - February 2019, 2020, and 2021, there are periods of consecutive high solar capacity factor days and periods of consecutive low solar capacity factor days during winter periods in the Carolinas. With approximately 4.3 GW of solar connected to the DEC and DEP systems today, Duke Energy has processes in place such as forward looking unit commitment of dispatchable resources considering solar and load forecasts sufficient to manage periods of consecutive low solar capacity factor days to ensure continued reliable operations. Given the capacity factors associated with current solar technologies during extreme cold weather, retiring other generation resources and relying exclusively on solar and storage as replacement resources could impact system reliability. The potential reliability issues are the result of the ways in which extreme cold weather can impact the energy needed to charge storage on low solar capacity factor days to ensure available peaking capacity. In addition to shorter periods of solar irradiance during the winter, and thus less daily energy from solar, Duke Energy's service areas have experienced winter weather fronts consisting of mostly cloudy days and frozen precipitation followed by extreme cold temperatures during clear nights and mornings with calm winds. Such a weather pattern most recently occurred from January 4 through January 7, 2018 where snow fell in Eastern North Carolina on January 4 and was followed by extreme cold weather conditions from January 5 to January 7. Figure 2 depicts the extreme cold weather in North Carolina on Sunday morning, January 7, 2018 and the shaded areas reflect snow remaining in Eastern North Carolina.

Notwithstanding the potential challenges of relying on solar during extreme cold weather events, Duke Energy observes that, in general, solar panels are angled toward the sun and thus, should shed snow and ice efficiently during clear, sunny days after a winter weather front has passed. Nonetheless, it is important to note the current limitations of some renewable generation technologies during these cold weather events. For example, as shown in Figure 5, the capacity factors for offshore wind resources are expected to be in the 45% – 55% range due to the proximity to gulf stream waters causing pressure differential. However, on January 8, 2018, wind speeds were fairly calm, predicting no appreciable offshore wind generation as shown in Figure 4. Accordingly, offshore wind can also experience certain limitations during periods of extreme cold weather.

Energy sufficiency evaluations will need to consider the load factor for extreme cold winter days as well. Solar, wind, and storage are variable with day-to-day, hour-to-hour energy output and are energy limited resources. Figure 1 shows the customer load profile for January 2-7, 2018 and the calculated load factor for January 7, 2018, which was 86%. This indicates very little deviation from hour to hour with the energy demanded by the DEC/DEP BA customers in the peak hour at 36.1 GW to the lowest demand hour at 26.1 GW. Figures 3 and 4 below reflect a high renewable, high storage, no coal portfolio dispatched against the actual 2018 January 2-8, 2018 extreme cold weather period reflecting several hours of unserved energy demand from customers (red shaded regions up to 3100 MW during one hour and 172 GWh of unserved energy overall).

Figure 1

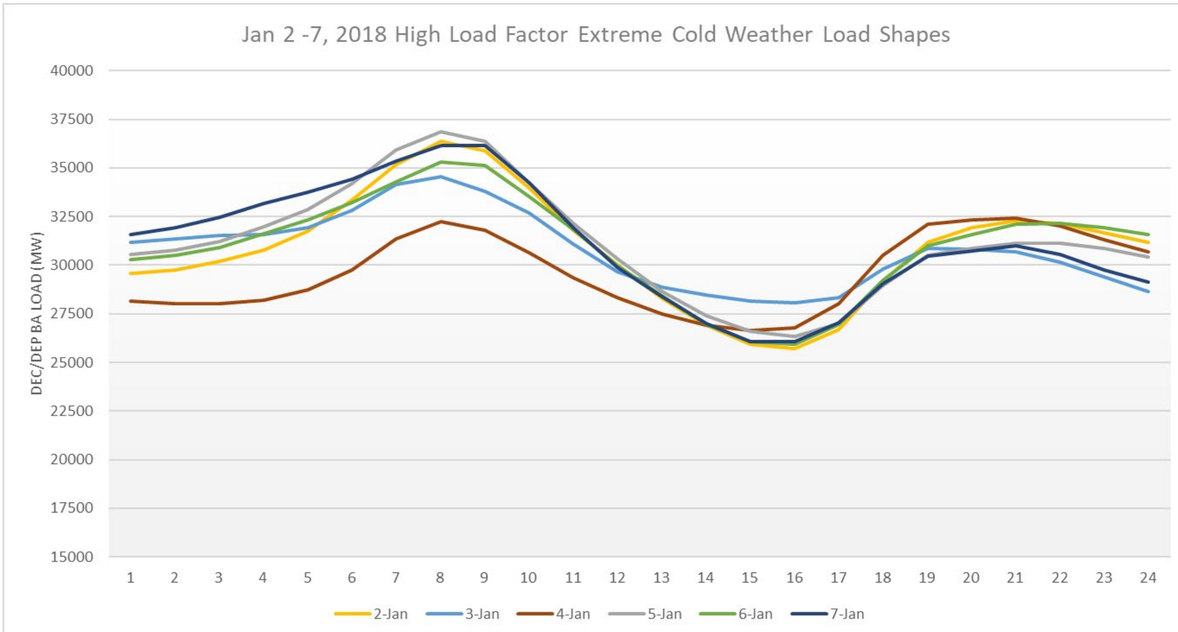
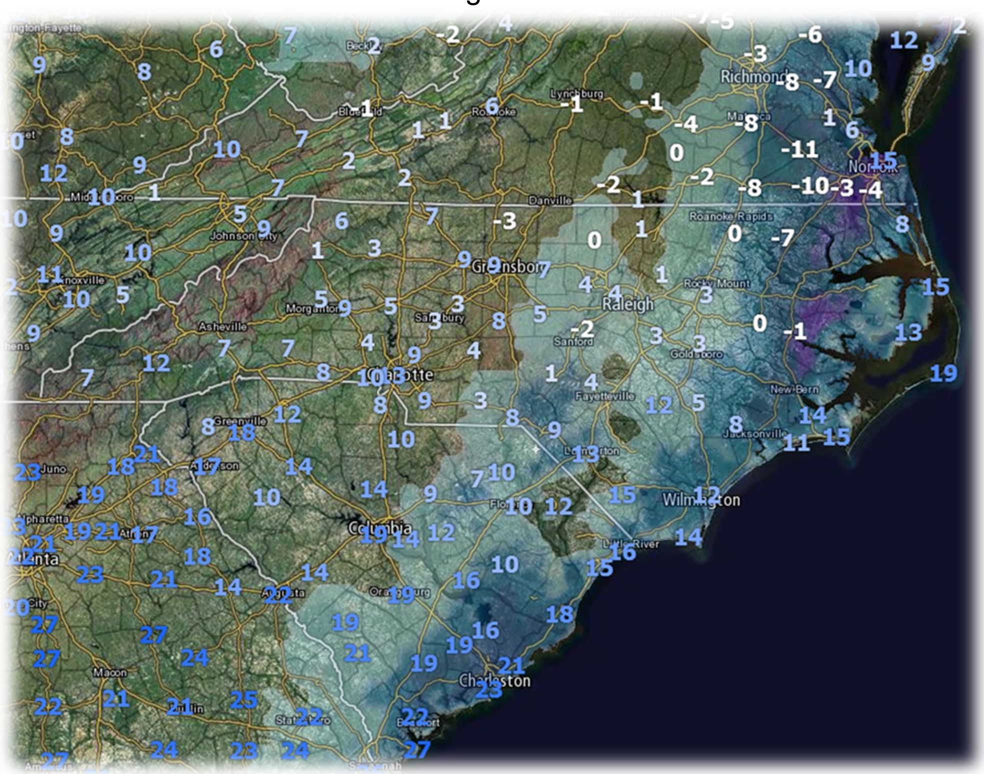


Figure 2



Intellicast.com

Figure 3

Resource	Existing MW	Proposed MW	Change
Nuclear	9,348	9,348	0
Advanced Nuclear	0	0	0
Solar	2,691	14,000	**11,309**
Solar+Storage	0	1,000	**1,000**
Onshore Wind (OK)	0	0	0
Offshore Wind (CAR)	0	2,400	**2,400**
Battery Storage (4 hour)	0	5,000	**5,000**
Combined Cycle	4,850	4,850	0
Combustion Turbine	6,369	7,052	**683**
Coal	10,583	0	(10,583)
Imports (Fossil)	0	1,500	**1,500**
Exports	0	0	0
Demand Response	938	2,400	**1,462**
Hydropower	1,409	1,409	0
Pumped Storage	2,140	2,140	0
Total Megawatts	38,328	51,099	12,771

Figure 4

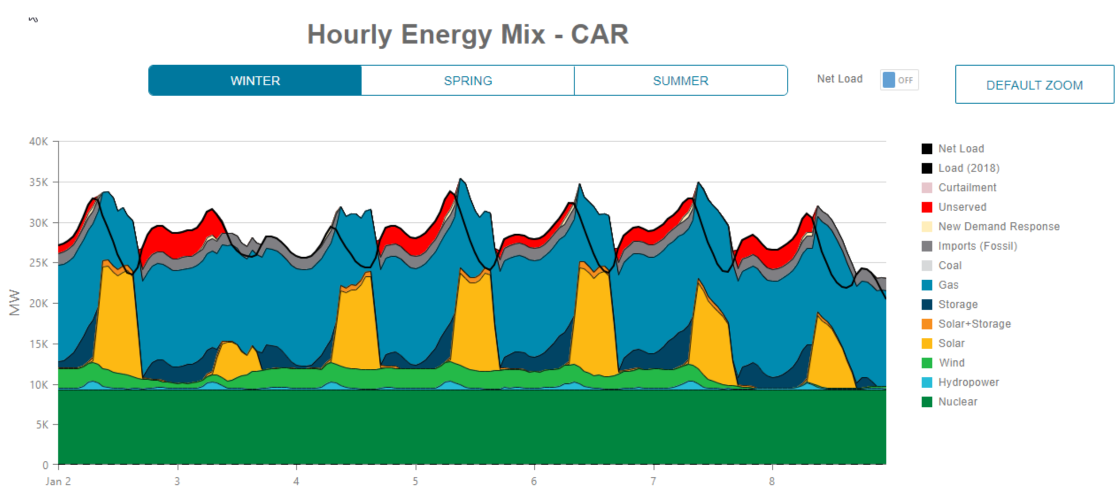


Figure 5

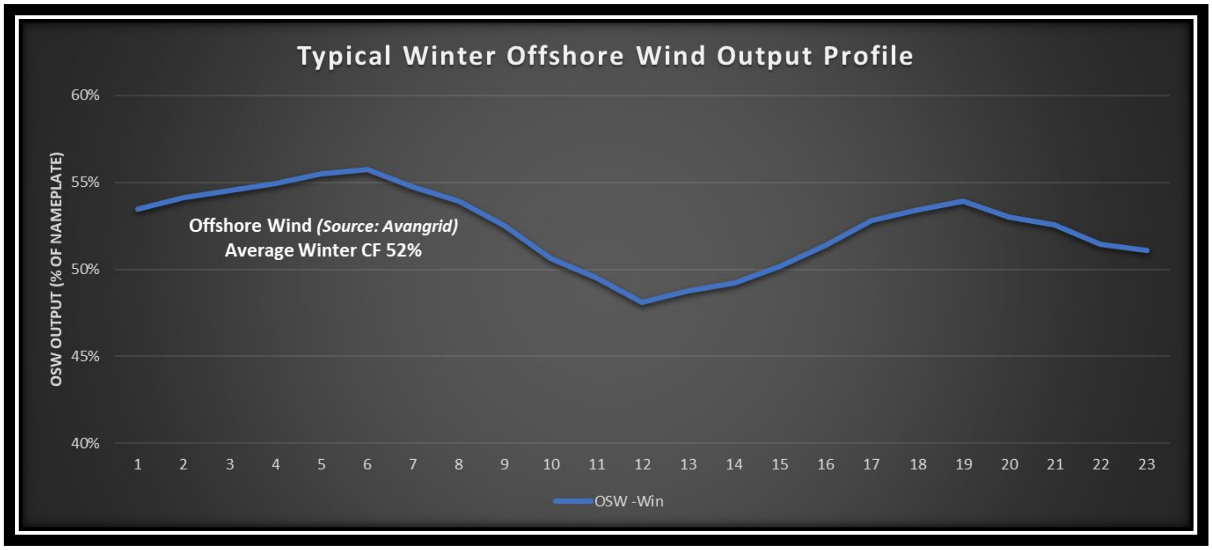


Figure 6

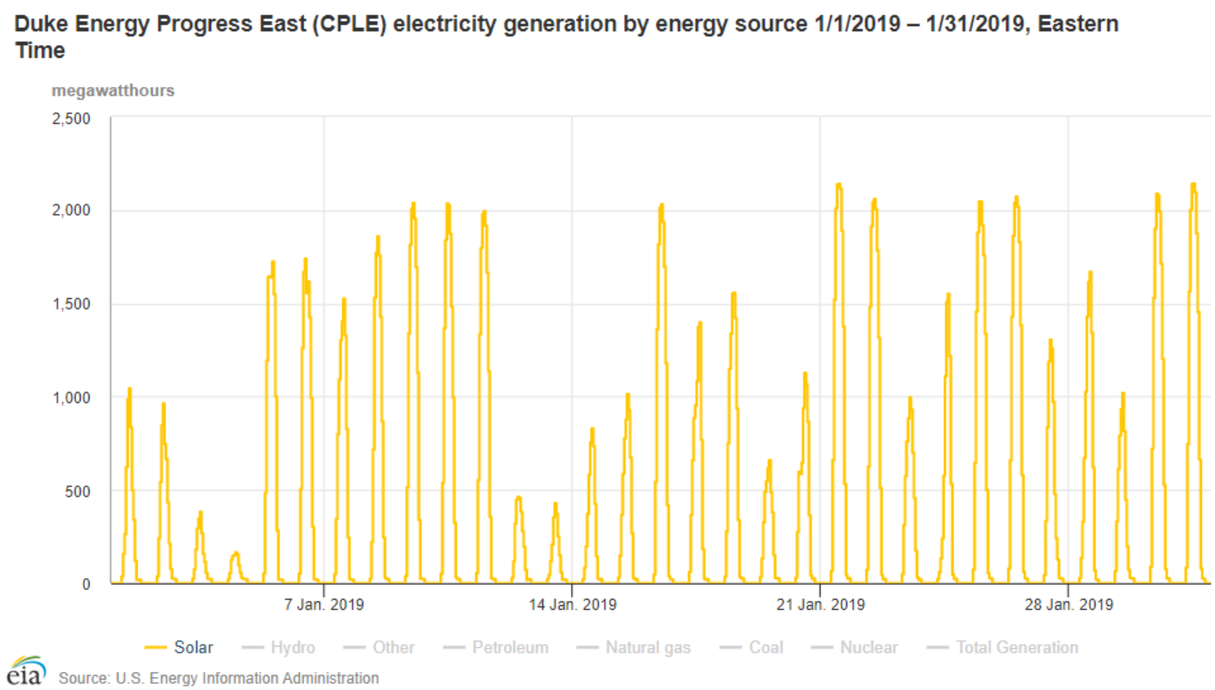


Figure 7

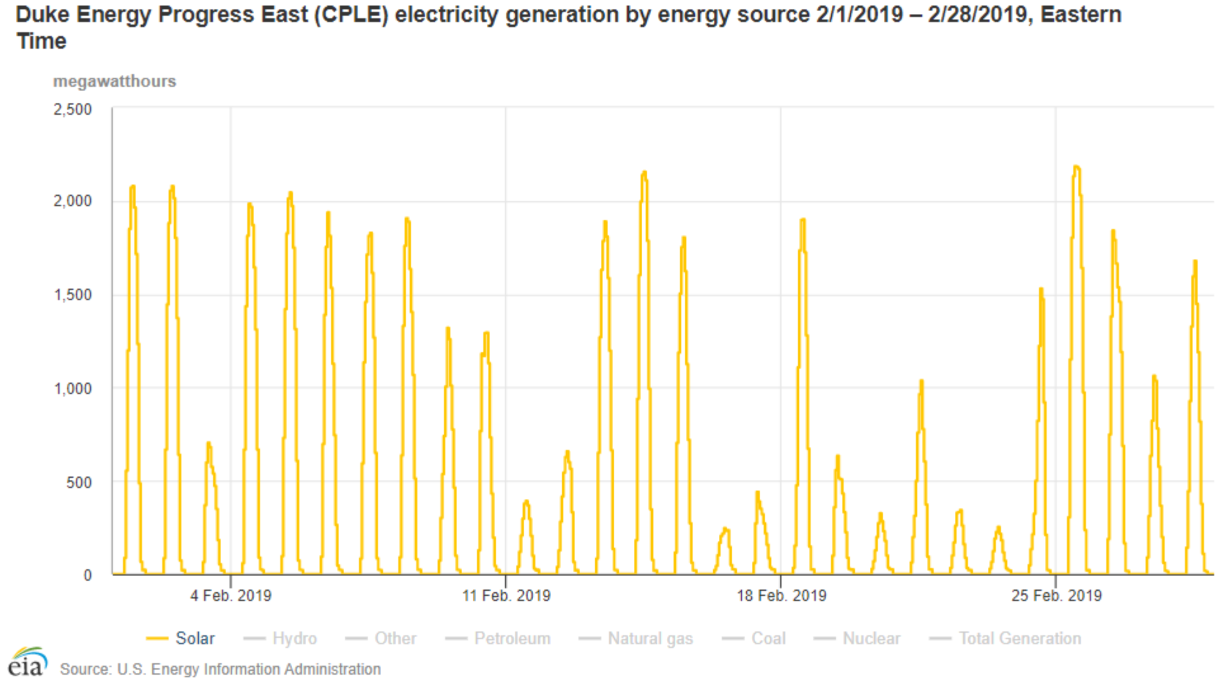


Figure 8

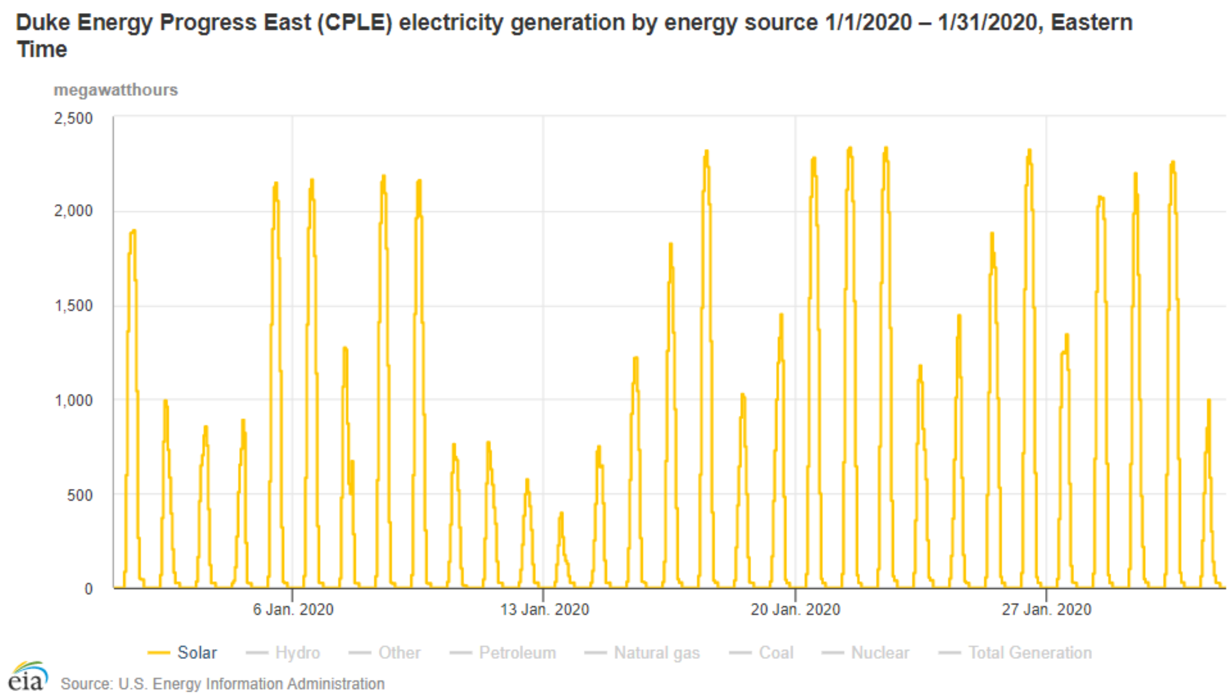


Figure 9

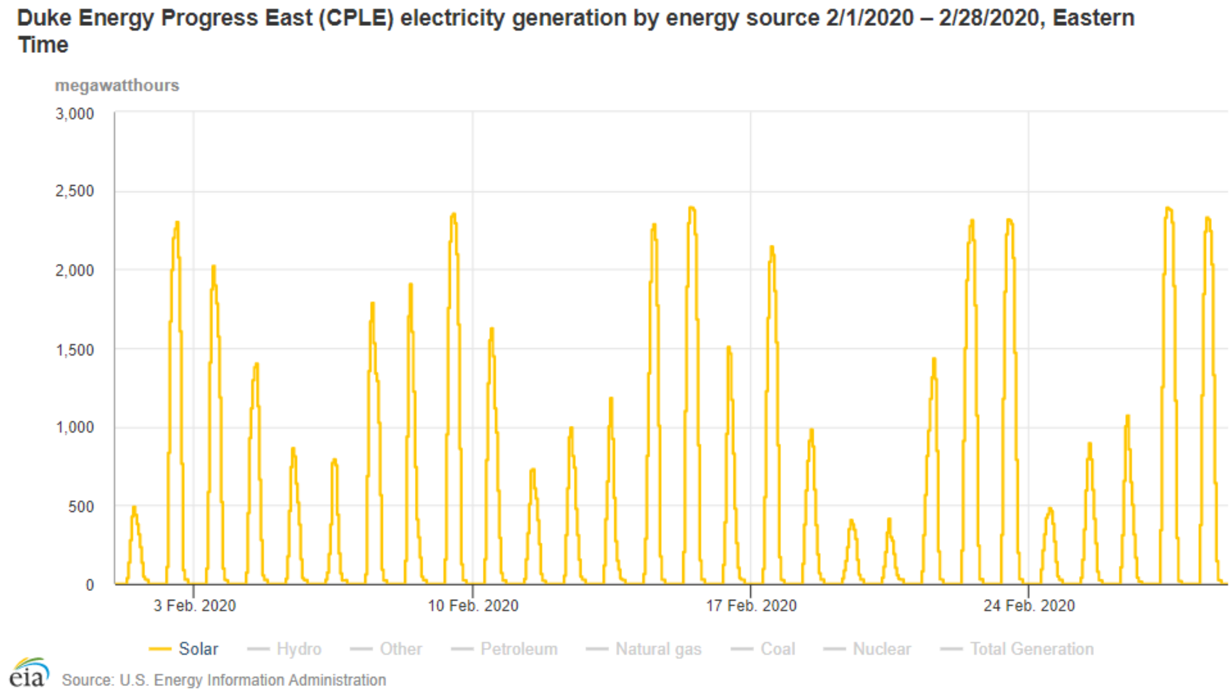

Duke Energy Progress East (CPLE) electricity generation by energy source 2/1/2020 – 2/28/2020, Eastern Time
megawatthours
3,000
2,500
2,000
1,500
1,000
500
0
3 Feb. 2020
10 Feb. 2020
17 Feb. 2020
24 Feb. 2020
Solar
Hydro
Other
Petroleum
Natural gas
Coal
Nuclear
Total Generation
Source: U.S. Energy Information Administration

Figure 10

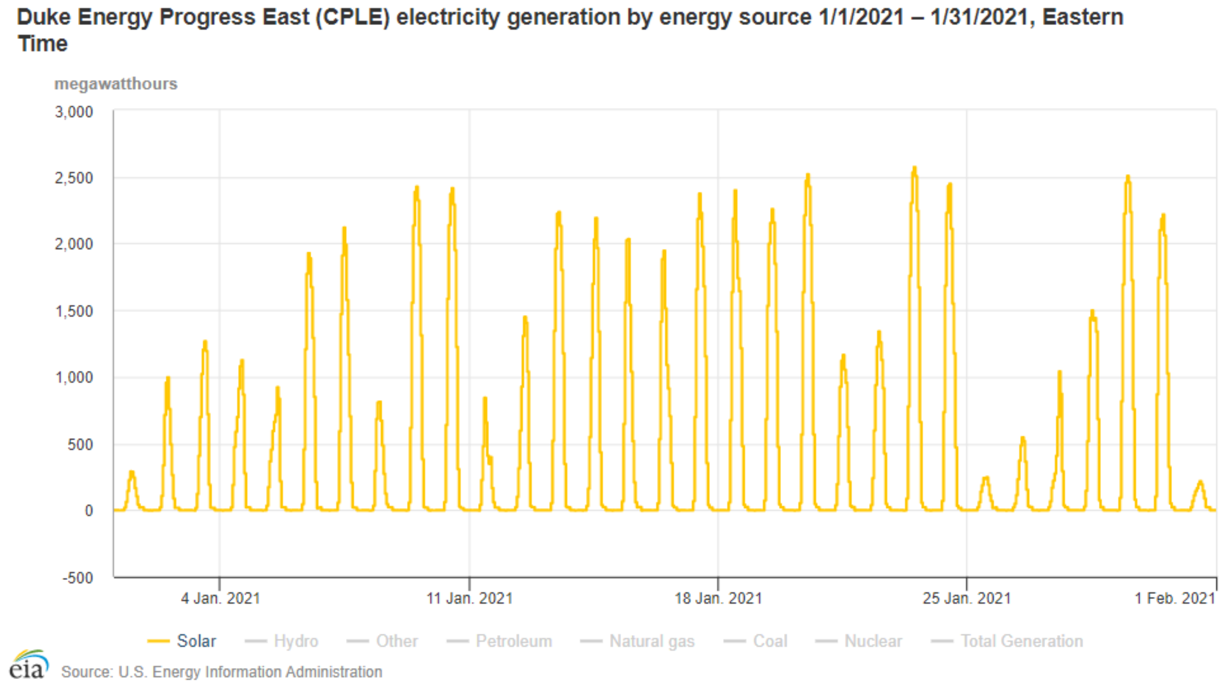
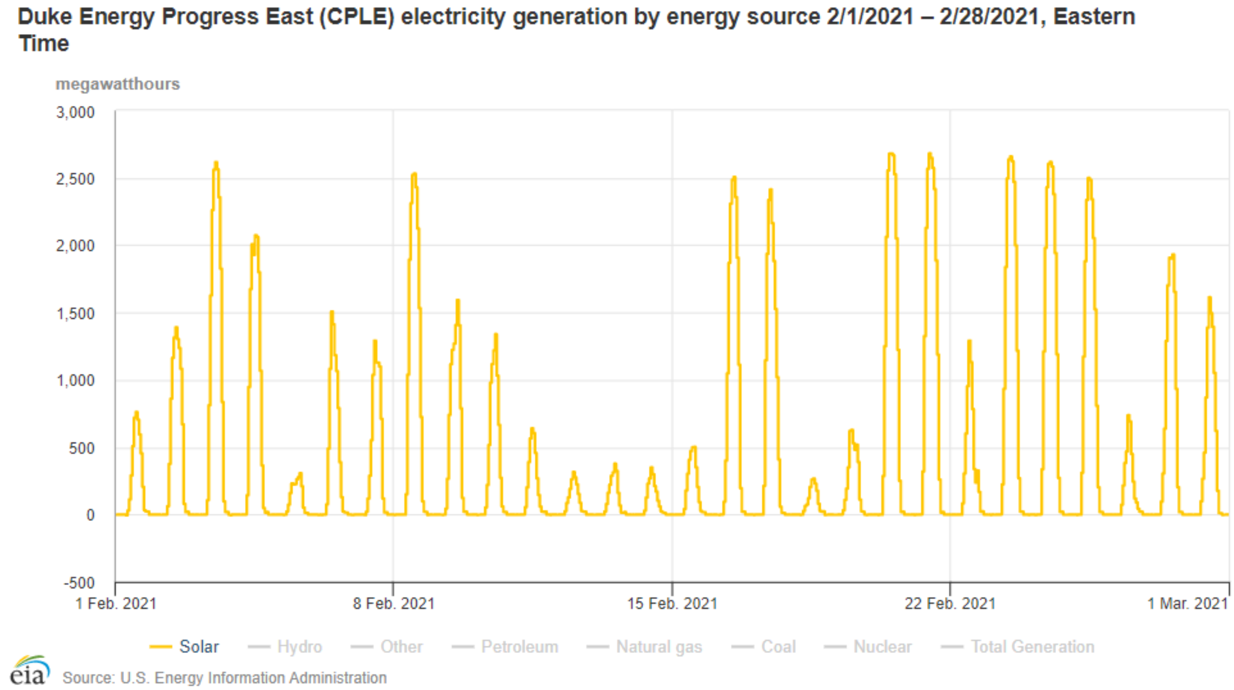

Duke Energy Progress East (CPLE) electricity generation by energy source 1/1/2021 – 1/31/2021, Eastern Time
megawatthours
3,000
2,500
2,000
1,500
1,000
500
0
-500
4 Jan. 2021
11 Jan. 2021
18 Jan. 2021
25 Jan. 2021
1 Feb. 2021
Solar
Hydro
Other
Petroleum
Natural gas
Coal
Nuclear
Total Generation
eia
Source: U.S. Energy Information Administration

Figure 11



<u>Load Shedding / Curtailment Planning:</u>

10. To what extent would critical natural gas infrastructure sites be exempted from emergency load shedding / rotating blackouts? Are any critical natural gas facilities on interruptible rates?

<u>Response</u>:

There are no natural gas facilities served by Duke Energy on interruptible rate plans.

Critical natural gas sites are included in Duke Energy's General Load Reduction Plan ("GLRP"). However, these locations have a high priority and would not be included in the 'first off' upon initiating the load reduction plan. Feeder rotation is implemented by operator interactions with the load shed application in the Distribution Management System based on a feeder prioritization list that is updated annually by planning engineers. The amount of load relief needed at the system level will determine whether distribution feeder rotation can be utilized or if transmission will need to reduce load by curtailment, which could impact some critical natural gas sites listed in the GLRP.

11. To what extent would water pumping stations or wastewater treatment facilities be

exempted from emergency load shedding / rotating blackouts?

Response:

Water pumping stations and waste treatment plants are included in Duke Energy's General Load Reduction Plan ("GLRP"). However, these locations have a high priority and would not be included in the 'first off' upon initiating the load reduction plan. Feeder rotation is implemented by operator interactions with the load shed application in the Distribution Management System based on a feeder prioritization list that is updated annually by planning engineers. The amount of load relief needed at the system level will determine whether distribution feeder rotation can be utilized or if transmission will need to reduce load by curtailment which could impact some critical water pumping stations or wastewater treatment sites listed in the GLRP.

12. **How often do you conduct simulation training of a load shedding event for control room operators?**

Response:

System Operators in the Energy Control Center receive annual training on Load Shed processes and Black Start simulations.

The Distribution Control Center Operations Group conducts training annually with qualified personnel, and they are refreshed on the advanced application of the load shedding tool and inputs.

13. **What is your plan for communicating with customers if emergency load shedding were necessary in the winter? What mechanisms / media would be used, and what would the key messages be?**

Response:

Duke Energy's robust communications plan for emergency load shedding is designed to provide timely and accurate information to the general public and Duke Energy customers using a variety of mass and direct-to-customer communication channels to maintain trust, confidence and understanding of what's occurring, why it's occurring and what to expect during a General Load Reduction/Capacity Shortage event.

If the Transmission Energy Control Center determined load shedding would be necessary in the winter, the Company would leverage multiple communication channels, including traditional mass media and social media channels (enterprise and Company spokespeople); Public Service Announcements (Radio/TV) digital platforms (website and outage map); direct-to-customer channels (email, text, outbound calls); and localized stakeholder outreach through our Government & Community Relations and Public Engagement staffs to ensure narrative saturation and customer feedback opportunities.

Following the 2021 events in Texas, the Company leveraged existing customer (residential, small business and Spanish-language) panels to validate and revise emergency load reduction messaging to ensure:

- Each individual message is clear
- The messages are simple and easy to understand
- The messages explain why Duke Energy needed to take action
- The messages explain to customers if they need to take action
- The messages effectively communicate important information to customers during a load reduction period

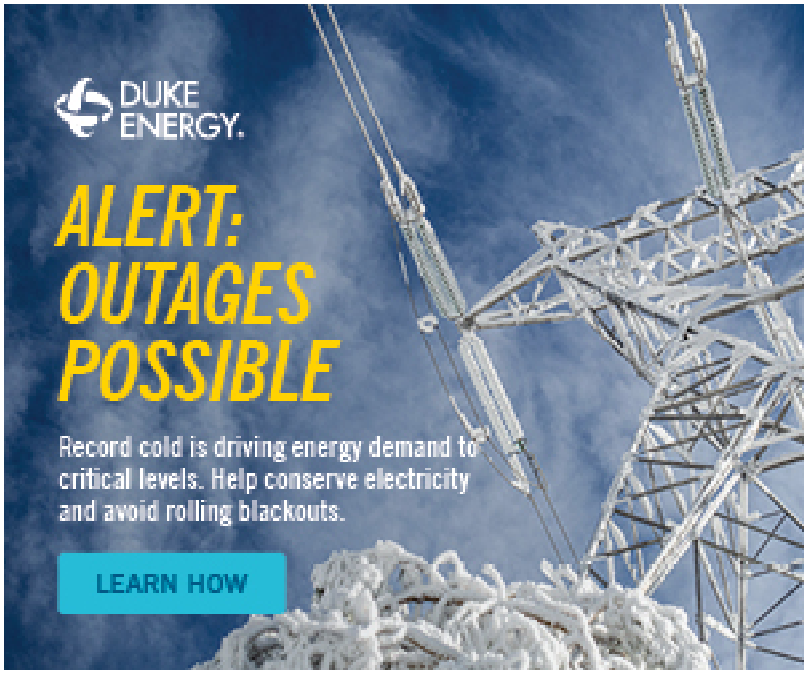
Messaging is also tested in real time by assessing content coverage, engagement and tone using Cision (a media monitoring tool) and Sprinklr (a social media engagement tool) and customer feedback is incorporated during post event assessments.

Messaging during a load shedding event in the winter focuses on explaining temporary power interruptions to customers. All mass and direct to customer channels will be saturated with these messages. Below are examples of messages and images Duke Energy provides to its customers regarding load shedding:

Winter Load shedding messages:

- **Temporary power interruptions**
- Due to extreme conditions and demand for electricity on the electric system, we are currently taking emergency steps to manage customer electric use.
  - We are conducting emergency temporary interruptions of service to customers to extend available power generation and help maintain operations until additional power is available.
  - These outages are temporary and rotated among customers and will continue until additional electricity is available and normal operation of the power grid resumes.

Winter load shedding sample images for social media, PSA, etc.

- 

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<u>Energy Transfers / Reserve Sharing</u>

14. Has your utility conducted the energy transfer studies that the FERC/NERC Report recommends on pages 227-228? Explain whether this would be useful.

<u>Response</u>:

Yes, Duke Energy has conducted the energy transfer studies that the FERC/NERC report recommends. Additionally, Duke Energy conducts seasonal internal readiness studies for 'Super Peak' conditions with a load 10% higher than the seasonal peak load to pre-identify system conditions and potential mitigation measures. In addition, Duke Energy participates in the SERC Long-Term Working Group and Near-Term Working Groups to assess the ability of the SERC-area transmission system for future years and seasons. Energy transfer studies are useful to the extent the expected system conditions are balanced with the obligations of the applicable entity to manage the costs of such improvements to its customers.

15. Describe the transfer capability of North Carolina's transmission system.

<u>Response</u>:

The North Carolina transmission system under the responsibility of Duke Energy is planned and operated to reliably serve the needs of its retail and wholesale customers as well to meet other contractual obligations of delivering and receiving electrical power to and from external entities. The Duke Energy system operators operate their respective transmission systems to ensure firm commitments are met.

Duke Energy maintains a Transmission Reserve Margin ("TRM") in the calculation of its Available Transfer Capability to account for various emergencies (e.g., inrush from a large generator being forced offline) and uncertainties related to the reliable operation of the transmission network. Part of the determination of TRM is to ensure the applicable Duke Energy system can withstand the loss of any impacting generator or the import/delivery of emergency power reserves. TRM is accessible to affiliate and non-affiliate customers through the declaration of a NERC Energy Emergency Alert.

16. Describe any reserve sharing agreements that your utility has in place with neighboring Balancing Areas. (For example, explain the VACAR reserve sharing group and provide a copy of any related agreements.) Could it/they be relied upon if the parties to the agreements all experienced cold weather at the same time?

<u>Response</u>:

The VACAR Reserve Sharing Arrangement ("VRSA") provides members of the group (the "VACAR Reserve Sharing Group" or "VRSG") the ability to access Contingency Reserves

("CR") of other members to respond to the loss of a resource. DEC and DEP are members of the VRSG. Each VRSG member carries a share of the total reserves of the group. In the event of a unit loss, a contingent member would employ its share of reserves and request the amount loss in excess of that share from one or more of the other members. The VRSA bases the use of these transfers of emergency energy on the bilateral interchange agreements and their associated emergency schedules. These are the general terms of the VRSA regardless of weather conditions.

During extreme weather (both hot and cold, hurricanes, etc.), the core principles of the VRSA still apply. Therefore, in the event a member experiences an energy emergency (levels of these are defined in NERC Reliability Standards and the associated Glossary and are commonly known as Energy Emergency Alerts or EEAs), whether related to a resource loss or other condition, the CRs of the other VRSG members can be used to varying degrees based on the EEA level. At the most extreme, EEA3, CR can be used to avoid or limit firm load shed.

Regarding emergency assistance from neighbors that are not VRSG members, emergency schedules are still in place, but available transmission capacity at the time will limit those transfers. VRSG members reserve transmission capacity between the members (known as TRM) to support the transfers needed to support the VRSG.

17. During the last three winter peaks, did any neighboring Balancing Areas (or, for DENC, the rest of PJM) also experience cold weather at the same time one of your Balancing Areas did?

<u>Response</u>:

DEC and DEP, being geographically co-located in North and South Carolina, frequently experience similar weather patterns and events. This extends, to some degree, to Dominion Energy South Carolina and South Carolina Public Service Authority to a lesser degree. PJM, as a neighboring Balancing Authority to the North, generally experiences more extreme cold weather events due to its large geographic area and the weather patterns of the mid-Atlantic states.

The VACAR South Reliability Coordinator ("RC") area, which is comprised of DEC, DEP, Cube Hydro Carolinas – Yadkin, Dominion Energy South Carolina, and South Carolina Public Service Authority, posts joint cold weather alerts in the form of a VACAR South Conservative Operations Watch or Warning.

Recent VACAR South Conservative Operations Watch/Warnings impacting Duke Energy Carolinas, Duke Energy Progress, and its Balancing Authority neighbors include:

2022 – January 14 and 20
2021 – February 17

18. During the last three winter peaks, did your utility experience any frequency drops below the allowable range? If so, explain.

Response:

According to the Reliability Coordinator Information System – no Frequency Events were noted during the past three Winter Peaks.

In addition, both DEC and DEP (together, "Duke Energy") maintain frequency requirements for the Duke Energy owned Nuclear Plants as specified in the Nuclear Plant Interface Requirements. Transmission will typically provide a grid frequency of 60 Hz +/- 0.06Hz at all times except for occasional momentary excursions outside of the band due to grid events. DEP additionally defines outer limits of 59.5 Hz to 60.5 Hz. These limits also line up with the continuous operation region for PRC-024, Generator Frequency and Voltage Protective Relay Settings. The three tiers of underfrequency load shed for DEC and DEP are set to 59.3 Hz, 59.0 Hz, and 58.5 Hz. The review of Winter 2018/19, 2019/20, and 2020/21 from November 1 through April 1 and Winter 2021/22 from November 1 to February 1 shows frequency remained for the most part between 59.94 Hz and 60.04.

19. For Duke, explain specifically whether the DEC/DEP Joint Dispatch Agreement has any bearing on extreme cold weather operations.

Response:

In extreme cold weather and non-cold weather operations, the DEC/DEP Joint Dispatch Agreement provides for the Companies to transfer non-firm economic energy between each other, if available, and does provide for opportunities to support each other given our diversified fleet of generation. In addition, in both extreme cold weather and non-cold weather operations, the Companies also have an approved As-Available Capacity Sales Agreement in place that allows the Companies to sell capacity on a short-term basis if one company has excess capacity and if firm transmission is available.