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April 20, 2022

VIA ELECTRONIC FILING

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

RE: Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's Technical Conference Presentation
Docket Nos. E-100, Sub 173 and M-100, Sub 163

Dear Ms. Dunston:

Enclosed for filing on behalf of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC (collectively, the "Companies") is the Companies' presentation during the April 19, 2022 scheduled technical conference in the above-referenced dockets.

If you have any questions, please let me know.

Sincerely,

Jason A. Higginbotham

Enclosure

cc: Parties of Record

Docket Nos. M-100, Sub 163; E-100, Sub 173

North Carolina Utilities Commission Technical Conference

Duke Energy's Responses to the Commission's Order dated January 26, 2022





DUKE ENERGY®

BUILDING A SMARTER ENERGY FUTURE℠

Sammy Roberts, GM Transmission Planning and Operations Strategy
and Joe McCallister, Managing Director System Optimization

April 19, 2022

Topics from Appendix A of the Commission's Order

- Lessons Learned From Texas
- Weather and Load Forecasting
- Power Plant Performance
- Load Shedding/Curtailment Planning
- Energy Transfers/Reserve Sharing

Lessons Learned from Texas

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.?

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?

February 2021 ERCOT Cold Weather Event Report Summary

Significant generator outages
- ERCOT averaged 34,000 MW of generation unavailable for two consecutive days

Significant firm load shed required
- 23,400 MW of combined manual firm load shed - largest controlled firm load shed event in U.S. history

Unprecedented power outages
- 4.5+ million people in Texas lost power - some as long as four days, while exposed to below-freezing temperatures for over six days.

Infrastructure interdependencies
- People were ordered to boil drinking and cooking water - Power cut to nursing homes and water pumping stations

Two main causal factors
- Generating units unprepared for cold weather failed in large numbers
- Significant natural gas production declines due to cold weather-related issues failed to meet both residential heating load and generating unit demand for natural gas

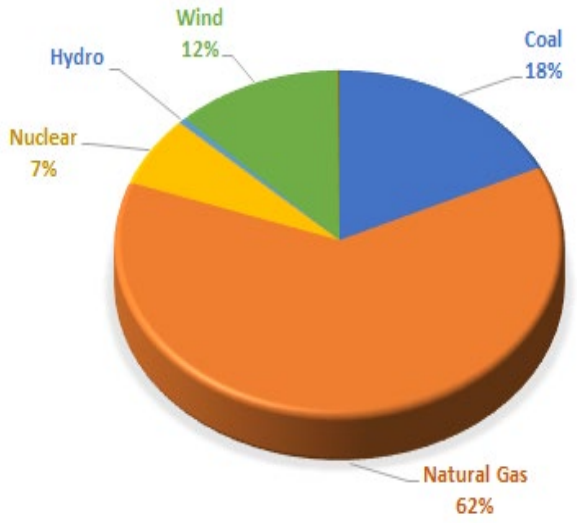
Lessons Learned from Texas

- Duke Energy has a culture of continuous improvement which has incorporated learnings from past weather events in Texas and other states
  - Duke Energy learnings and changes associated with:
    - ERCOT 2011 Cold Weather Event
    - Jan 7, 2014 – Polar Vortex
    - Feb 20, 2015 – Polar Vortex #2
    - Jan 2-8, 2018 – Bomb Cyclone
    - ERCOT 2021 Cold Weather Event
- NERC's cold weather preparedness standards
  - Requirements for GO/GOP/RC/BA/TOP (EOP0011-2, IRO-010-4, and TOP-003-5)
  - NERC Reliability Standards to be implemented on or before 04/01/23

Ability to learn from other entities and adapt Duke Energy's preparedness practices

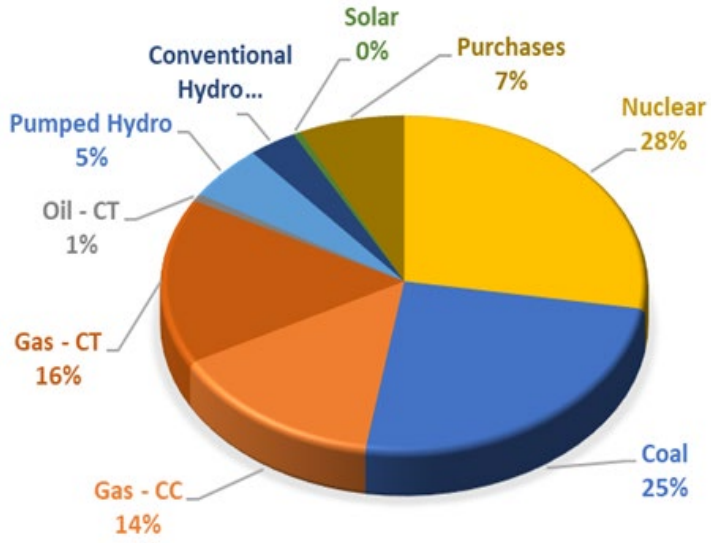
Comparison – ERCOT and Carolinas 2021 and 2035 Winter Peak Planned Mixes

2021 ERCOT WINTER PEAK RESOURCE CAPABILITY



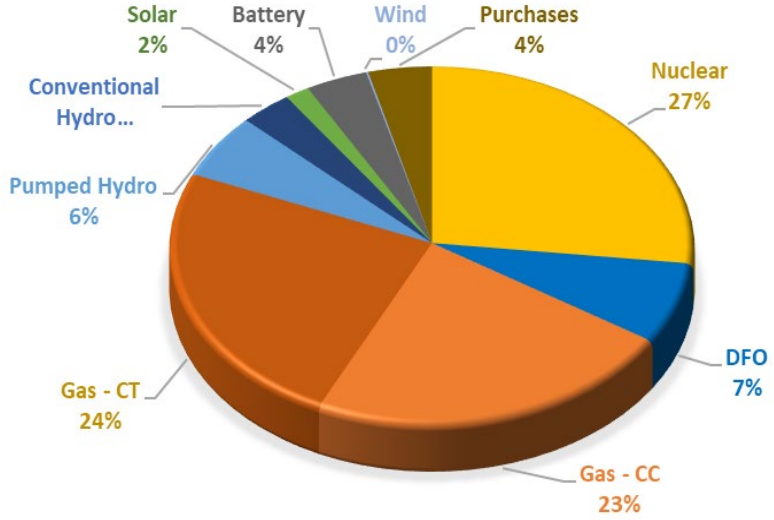
Source: ERCOT

2021 CAROLINAS WINTER PEAK RESOURCE CAPACITY



Source: 2020 IRP

2035 CAROLINAS WINTER PEAK RESOURCE CAPACITY



Source: 2020 IRP

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.

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

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?

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

Weather and Load Forecasting

- Weather and load forecasts
  - Full-time meteorologists with decades of experience
  - Development of internal weather forecast and use of external weather forecasts
  - Process for models include temperatures, Cloud Cover, Dew Point, Wind Speed, load history
- Models for loads/unit forecasting
  - Weather attributes and forecasts processed into load forecasting models
  - Carolinas Unit Commitment team utilizes load forecasts and tools for 7-day plan
- Monitoring and Continual improvement
  - Daily and real-time monitoring, ability to adjust throughout day.
  - Mean Absolute Percent Error (MAPE) – measures load forecast deviation from actual load
  - Evaluating additional models and data

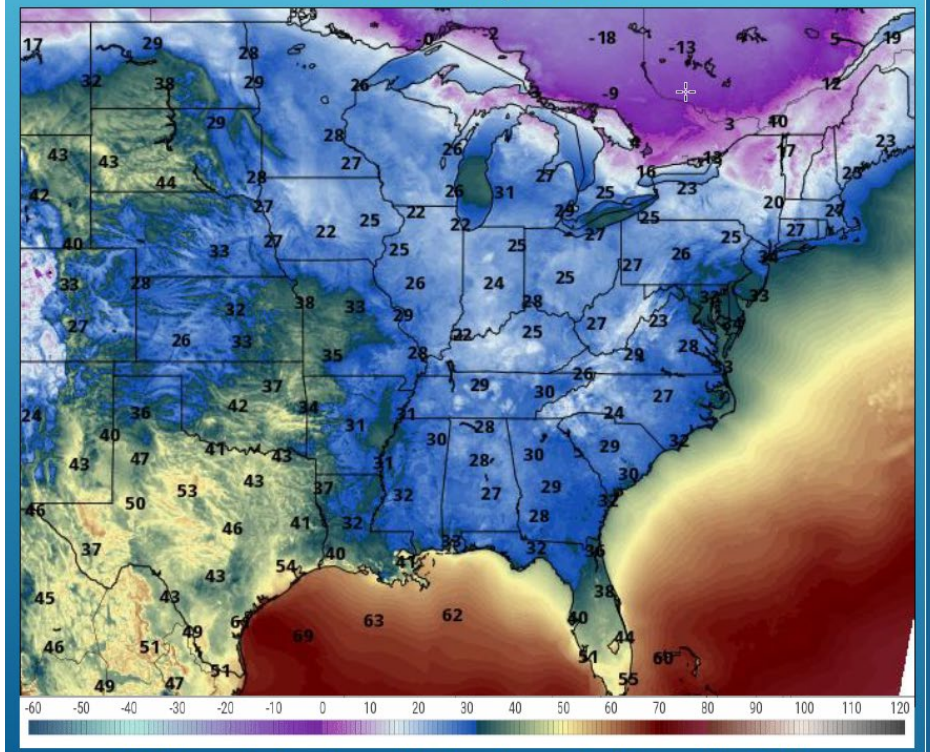
Process to forecast weather and load

To Prepare, You Must Be Aware

COLD AIR WATCH

Tuesday, January 18, 2022

Current Temperatures



Click here for hourly-updated surface charts (see Wind Chills toward bottom)

1-5 Day Outlook:

Cold temperatures are across much of the Eastern US this morning with lows in the teens and 20s from the Northeast to Southeast. Even Florida is chilly with lows in the low 40s into Orlando. Weak ridging will allow for a briefly warmer pattern Wed – Thurs across the East as highs turn slightly above normal. However, another Canadian polar air mass will dive southward into the Midwest midweek bringing very cold weather to the Great Lakes and Ohio Valley Thurs – Fri. Minneapolis will see lows around -10°, single digits and teens from Milwaukee to Cincinnati with even colder wind chills.

Another significant winter storm could impact the Southeast and Mid-Atlantic on Fri – Sat. Temps are very cold in the Carolinas on Fri stuck in the 20s and 30s with accumulating snow and ice.

Long-Range Outlook:

6-10 Day: This period is cold across the Eastern US with below to much below normal temperatures far-reaching. The Midwest is cold early period, followed by colder temperatures reaching the East late.

11-15 Day: A moderating pattern into early Feb is forecast as the MW leans seasonal, while cold may linger early across the East Coast.

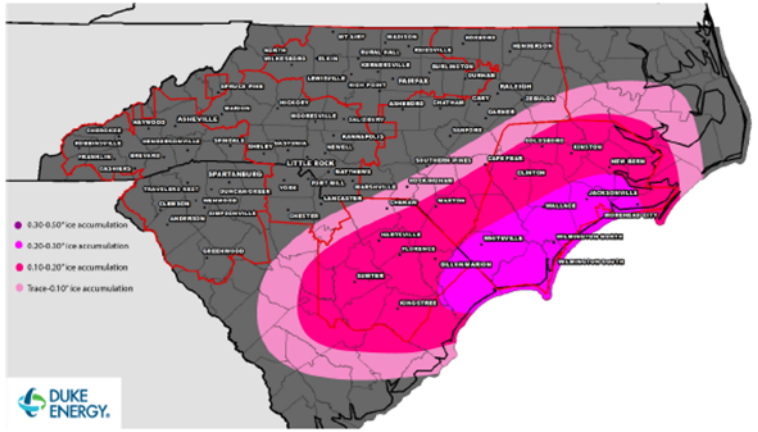
DUKE ENERGY.

Carolinas Special Weather Statement
Issued: 1/20/2022 8:29 AM

Weather Discussion

A cold front will move slowly through the Carolinas today with colder air moving into the region behind the front overnight. Rain likely today. Light winter mix will develop after midnight mainly east of I77. Light snow/sleet will fall east of I77 to I95 corridor where the precipitation will become a mix of freezing rain and sleet. Accumulations of snow between a trace to 3" are possible east of I77 to I95 from Friday morning through Friday night. East of I95, freezing rain will result in ice accumulations up to 0.25" or less with the higher amounts along the immediate coastal counties from New Bern south to Wilmington. Further inland, amounts will be less with more sleet possible. The winterly mix with end by Saturday morning. Significant power outages are possible across the Coastal Zone with scattered outages possible across the eastern Pee Dee Friday night.

Forecast Ice and Snow accumulation maps are below.



Power Plant Performance

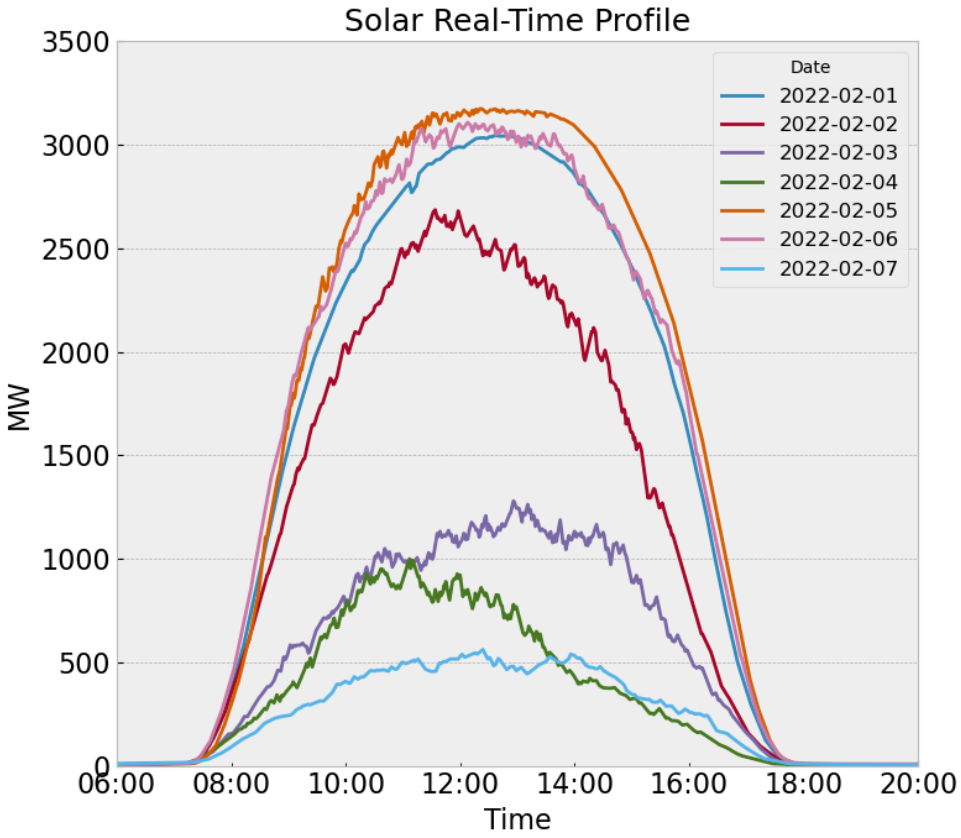
7. During the last three winter peaks, what generating units were unable to operate due to the cold weather or weather-related fuel constraints, and what action has the utility taken to address the problem?

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?

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?

Power Plant Performance

- No coal, gas, or hydro units were unable to operate during the last three winter peaks
- Diversity of generation resources is important all the time not just during extreme weather
- Gas-burning plants, gas curtailment, and Duke actions
  - Oil backup, testing on fuel oil prior to cold weather and starting units early
- Changing generation resource mix
  - Solar and wind performance in extended cold weather
  - Solar output is limited and significantly variable during cold winter months



Ability to maintain diverse generation resources

Integrated Fuel and Market Coordination – Active Planning and Management

Internal

ECC's / Power Plants

- Reliability
- Unit Status / Fuel Availability
- On-site Inventory
- Pipeline Conditions

Fuels and Power Trading / Dispatch

- Fuel and Power Market Pricing
- Power Purchases
- Incremental Fuel Adjustments
- Fuel delivery and inventory management

Weather / Unit Commitment

- 7 to 10 Weather / Load Forecast
- Unit Commitment

Fuel Supply/Transport Management

External

Railroads / Pipelines / LDC

- Nominations
- Operational Conditions
- Fuel Delivery Performance
- Monthly / Daily / Intraday Supply Management

Suppliers / Markets

- Annual / Seasonal / Monthly / Daily / Intraday Procurement
- Nominations
- Performance

Integrated Fuel and System Planning and Coordination ensures fuel supply for reliable generation and system reliability

Considering Cold Weather Operations with High Renewable Penetration

High renewable, non-conforming to winter load shape, portfolio with less base load resources

- Still need to incorporate lessons learned from new cold weather events and proactively prepare
- Many current practices and procedures for preparing for cold weather events will still apply
- Imperative to be able to shift energy from non-peak times to peak hours
- Imperative to have supplemental power supply resources to sustain a reliable power supply when renewable output is low for consecutive day periods
- Diversity of resource mix will continue to be important
- Fuel assurance, for fuel supply that can be managed, will be increasingly important
- Load forecasting tools will need to adapt to behind the meter resources decoupling historical load vs temperature correlations
- Some decentralized resource management will be needed

Load Shedding/Curtailment Planning

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?

11. To what extent would water pumping stations or wastewater treatment facilities be exempted from emergency load shedding / rotating blackouts?

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

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?

Load Shedding/Curtailment Planning

- No natural gas facilities are on interruptible rate plans
- Load shed critical natural gas infrastructure – identified as critical load
  - High priority not to be shed but are in the load reduction plan
- Load shed water pumping stations or wastewater – identified as critical load
  - High priority not to be shed but are in the load reduction plan
- Simulation training for control room operators of load shedding annually
- Communication of load shedding to the public
  - Variety of mass and direct-to-customer communication channels

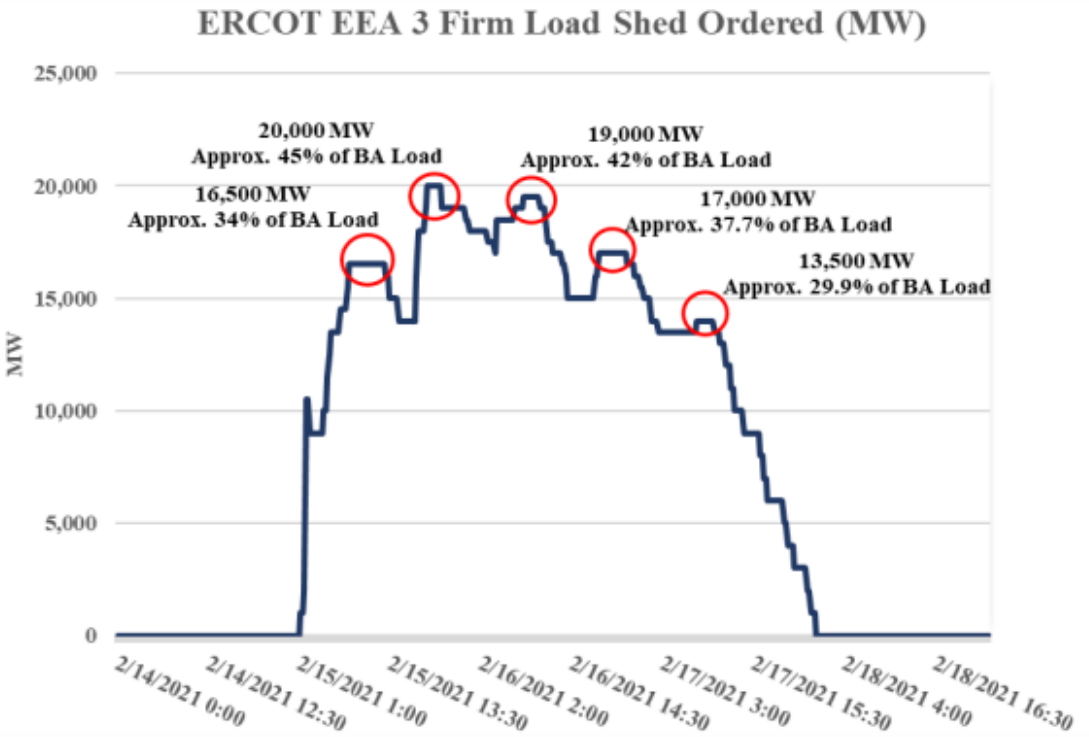
Ability to plan for and communicate load shedding

Firm Load Shed Coordination

First - General residential customers, small and medium commercial and industrial customers. The largest number of customers should be assigned to this group (should be at least 50% of Region load).

Second - Large industrial and wholesale customers served from distribution (recommended to be 30% of Region load).

Last - Hospitals, nursing homes, and other critical agencies; local/state security agencies, communication centers, and news media facilities deemed extremely critical to public health and security; this group would also include county/municipal water treatment/sewage processing systems; gas compressor stations (should be no more than 20% of Region load).



Some firm load shed circuits in ERCOT interrupted power to critical gas supply facilities and nursing homes

Operators in ERCOT were faced with the potential to manually shed load on circuits reserved for UFLS

Load Shedding/Curtailment Planning

Daily Generation Grid Status

Region	Jan-17-2022	Jan-18-2022	Jan-19-2022	Jan-20-2022	Jan-21-2022	Jan-22-2022	Jan-23-2022	Jan-24-2022
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon
DEC Grid Status Alert Level								
DEP Grid Status Alert Level								
DEF Grid Status Alert Level								
DEI Grid Status Alert Level								
DEOK Grid Status Alert Level								

Grid Status Legend

Alert Level Description	NORMAL			SYSTEM RELIABILITY ALERT Operating reserves are less than the Operating Reserve Requirement			CAPACITY SHORTAGE ANTICIPATED All available resources are committed			LOAD MANAGEMENT PROCEDURES in effect			MANUAL LOAD REDUCTION Emergency Action			SYSTEM RESTORATION Blackout has occurred (Partial or entire system)		
Duke Energy Alert Level	Grid Status GREEN			Grid Status YELLOW			Grid Status ORANGE			Grid Status RED			Grid Status PURPLE			Grid Status BLACK		
NERC EEA Level	EEA 0			EEA 0			EEA 1			EEA 2			EEA 3			EEA 3		
Conservative Operations Notify RC,TOP,GOP,&IT of the Alert Level Description	NO			POSSIBLE			YES			YES			YES			YES		
Duke Energy Region	DEC	DEF	DEP	DEC	DEF	DEP	DEC	DEF	DEP	DEC	DEF	DEP	DEC	DEF	DEP	DEC	DEF	DEP
Reserve level threshold to enter this stage	> Operating Reserve Requirement			1,610 MW	1,400 MW	1,200 MW	1,100 MW	800 MW	900 MW	550 MW	400 MW	400 MW	Load > Projected/Actual Capacity			Depends for Partial or Total Blackout		
Reserve level at the floor of this stage	1,610 MW	1,400 MW	1,200 MW	1,100 MW	800 MW	900 MW	550 MW	400 MW	400 MW	0 MW	0 MW	0 MW	N / A					

Energy Transfers/Reserve Sharing

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.

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

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?

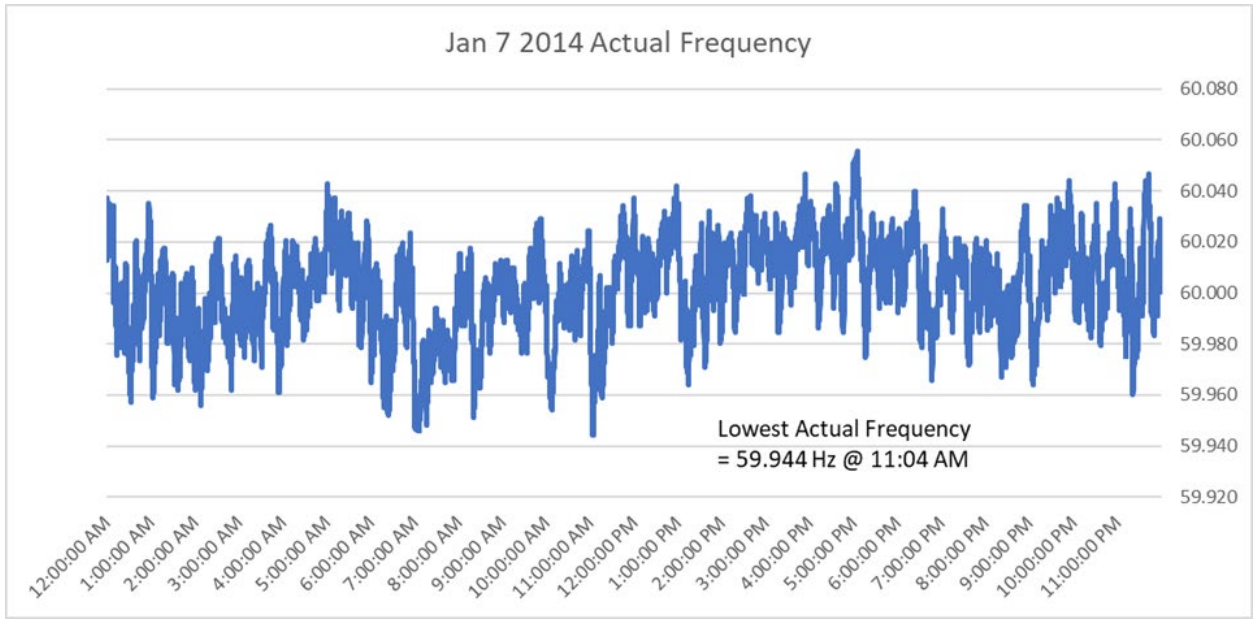
17. During the last three winter peaks, did any neighboring Balancing Areas (or, for DENC, the rest of PJM) also experience cold weather at the same time one of your Balancing Areas did?

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

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

Energy Transfers/Reserve Sharing

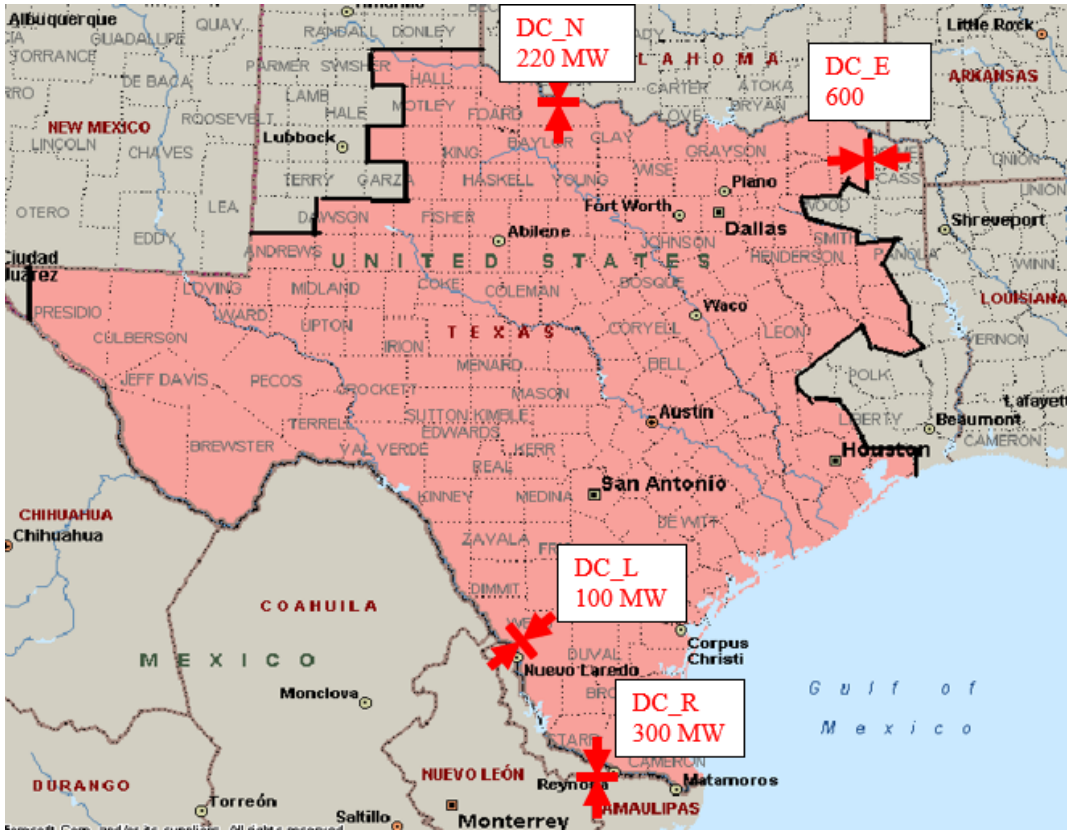
- Energy Transfer Studies
- Transfer capability of North Carolina Transmission system
- VACAR reserve sharing agreement
- Frequency drops
  - No frequency events during the last three winter peaks
  - 59.3 Hz is first level of UFLS



Ability to transfer energy when needed

Emergency Assistance from Neighbors

ERCOT was only able to import 820 MW out of its 1220 MW tie capability during the forecasted peak hour on February 15.



Emergency Assistance from Neighbors

DEC/DEP currently uses a little over 1800 MW of imported capacity purchases for resource adequacy. In addition, DEC/DEP maintain almost 1000MW of transmission capacity to enable importing emergency energy from neighboring entities should DEC/DEP lose a large capacity resource. When DEC/DEP purchases capacity to import, it secures firm transmission service to provide a certain level of reliability. Unfortunately, most imported capacity purchases are non-dispatchable which doesn't provide the flexibility needed to integrate intermittent renewables.

Furthermore, as stated in the October 2021 NCUC Technical Conference, DEC/DEP consider 2,000MW of non-firm imports from neighbors during winter peak periods in resource adequacy studies. This compares with DEC/DEP importing 1,057MW non-firm on Feb 20, 2015.

CERTIFICATE OF SERVICE

I certify that a copy of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's Technical Conference Presentation, in Docket Nos. E-100, Sub 173 and M-100, Sub 163, has been served by electronic mail, hand delivery, or by depositing a copy in the United States Mail, 1st Class Postage Prepaid, properly addressed to parties of record.

This the 20th day of April, 2022.

Jason A. Higginbotham
Associate General Counsel
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