



Jason A. Higginbotham  
Associate General Counsel

525 S. Tryon Street, ECA3  
Charlotte, NC 28202

o: 704.731.4015

Jason.Higginbotham@duke-energy.com

December 21, 2023

**VIA ELECTRONIC FILING**

Ms. A. Shonta 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  
Presentation from the September 26, 2023 Winter Storm Elliott  
Technical Conference  
Docket No. M-100 Sub 163**

Dear Ms. Dunston:

Enclosed for filing in the above-referenced docket, please find Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's presentation from the Winter Storm Elliott Technical Conference held on September 26, 2023.

If you have any questions, please let me know.

Sincerely,

A handwritten signature in black ink that reads "Jason Higginbotham". The signature is written in a cursive, flowing style.

Jason A. Higginbotham

Enclosure

cc: Parties of Record

OFFICIAL COPY

Dec 21 2023

## Duke Energy Carolinas and Duke Energy Progress

---

### **North Carolina Utilities Commission Update Regarding December 24, 2022 Winter Storm Elliott (WSE) Load Reduction Event**

September 26, 2023



# Introduction

---

- Kendal Bowman: State President, North Carolina
- Nelson Peeler: SVP, Transmission and Fuels Strategy and Policy
- Sam Holeman: VP Transmission System Planning & Operations
- Preston Gillespie: EVP, Chief Generation Officer and Enterprise Operational Excellence
- Eric Grant: Carolinas Regional SVP, Customer Delivery
- Taryn Sims: VP Marketing, Insight & Customer Engagement

# Transmission & Fuels Strategy and Planning (TFSP) Fuels and System Optimization (FSO)

Nelson Peeler



## TFSP/FSO - Post-Event Review Actions

### Summary

- Reviewed December events against processes, models, and tools utilized for load forecasting to identify action items
- Currently, 10 of 12 identified action items for Fuels and Systems Optimization completed; update focuses on:
  - Forecasting Enhancements
  - Benchmarking with Neighbors
  - Formalization of Cross-Functional Grid Risk Assessment Team Process
  - Dynamic Adjustments for Forecast and Outage Uncertainty

## TFSP/FSO - Post-Event Review Actions

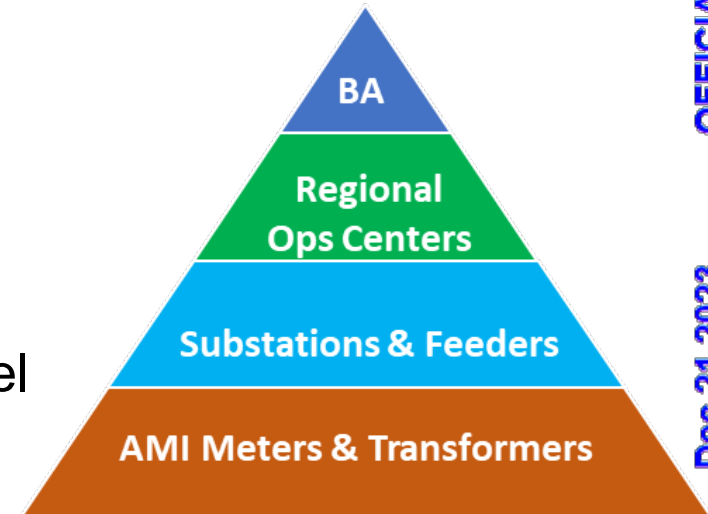
### Forecasting Enhancements

- Updated models from December with estimated load without load shed and conducted vendor reviews
- Performed analysis to expand understanding of Carolinas customer heat strip inflection during winter periods to help identify Heating Degree Days (HDD) breakpoints for load models
- Reviewed and adjusted HDD and Cooling Degree Days (CDD) breakpoints to further enhance forecasts
- Evaluating separate linear regression model that can help indicate higher load forecasts
- Investigating bottom-up short-term load forecasting methods that utilize customer meter level data

## TFSP/FSO - Post-Event Review Actions

### Forecasting Enhancements - Bottom-Up Load Forecasting

- Bottom-up load forecasting can utilize AMI data to help inform customer behaviors in a Balancing Authority (BA) level forecast.
- Duke Energy has AMI data for 98% of its residential customers.
  - Splitting up load into smaller segments at the operational center level has shown benefits to our neighbors
- Potential advantages of bottom-up forecasting:
  - Can geographically map localized operational center loads & weather instead of population weighted major city weather over wider load area
  - Can provide customer insights of usage behaviors and be able to identify different load types by customer (EVs, heat pumps, rooftop solar, space heaters) to better inform behavior as part of the load forecast process
  - Could result in more accurate BA level forecasts as load behaviors change over time



## TFSP/FSO - Post-Event Review Actions

### Follow-Up Assessments - Benchmarking with Neighbors

- Performed benchmarking with regional neighboring utilities and RTO
- Benchmarked against:
  - Forecast Error Observed on December 24, 2022
  - Number of Load Forecast Vendors
  - Internal and External Weather Inputs to Load Forecast Models
  - Number of Contiguous Regions
  - Accounting for Customer Behavior
  - Resources Focused on Load Forecasting and Enhancement
- Summary observations included:
  - Similar load forecasts errors and challenges on December 24, 2022
  - Utilization of multiple external load forecasting vendor models
  - Utilization of external weather sources and contracted meteorologist
  - Bottom-up load forecasting methods and use of customer AMI meter data by one company
  - Varying levels of routine short-term load analysis and feedback loops



## TFSP/FSO - Post-Event Review Actions

### Formalized Cross-Functional Grid Risk Assessment Team Process

- Cross-functional Grid Risk Assessment process was formalized to identify potential risks to maintaining adequate short-term planning reserves
- Grid Risk Assessment Team meeting is initiated when certain risks are present such as:
  - Forecasted Planning Reserves are below targets
  - Abnormal temperature forecasts and significant storms
  - Fuel exceptions that can impact generation availability
  - Unplanned outages or emerging generation availability risks
  - Regional grid conditions and limitations to potential purchases
- Grid Risk Assessment Team meetings:
  - Review identified risks
  - Discuss potential mitigations
  - Establish necessary action items coming out of the meeting, including escalating to a Grid Threat call
  - Communicate out to internal stakeholders and key executives

**Provides for greater rigor in review, discussion and communication of risks to reserves**

## TFSP/FSO - Post-Event Review Actions

### Dynamic Adjustments to 7-Day Unit Commitment For Forecast and Outage Uncertainty

- Additional forecast and generation outage uncertainty to projected short-term reserves added to the daily 7-Day Peak Load Forecast
- Dynamic reserve adjustments estimate the MW risk above the forecasted 7 Day-Ahead planning reserves
- Provides additional information to evaluate potential actions that may be needed to maintain adequate day ahead planning reserves

**Provides visibility in discussing uncertainty and risk particularly when reserves are tighter**

# System Operations | Sam Holeman

---



## System Operations - Post-Event Review Actions

### Key Preparedness Related Actions

| Issue  | Corrective Action  | Status  |
|--|--|---|
| DEC and DEP Day-ahead Operating Reserve Margin Targets need to be reviewed for consistency and consideration of seasonal impacts and reviewed on a periodic basis. | Develop procedure that governs Day-ahead Reserve Margin Target calculation, ensuring consistency and accounting for variability in load forecast errors and generation.      | In Progress:<br>Industry Poll complete, procedure drafted and in finalization process. Completion expected by Winter 23/24. |
| DEC and DEP GLRPs (General Load Reduction Plans) are very different in both style and content which present challenges to stakeholder understanding and adherence. | Convert DEC and DEP GLRPs into one standardized plan addressing necessary differences between DEC and DEP. Train operators on any changes resulting from combined processes. | In Progress:<br>Completion expected in time for 2024 filing.  |

## System Operations - Post-Event Review Actions

### Key Wholesale Customer Related Actions

| Issue  | Corrective Action  | Status   |
|--|--|--|
| Network (wholesale) Customers do not all have load shed processes coordinated with Duke Energy.                          | Communicate with each Network Customer to identify load shed capabilities and garner agreement on process to shed load when instructed by Duke Energy. | In Progress:<br>Coordinating with each Network Customer.<br>Completion expected by Winter 23/24. |
| No programmatic method to communicate quickly to all Network Customers the need to implement their load shed procedures. | Develop a tool/capability to communicate to all Network Customers the need for them to curtail/shed load.  | In Progress:<br>Technology solution identified. Completion expected by Winter 23/24.             |

## System Operations - Post-Event Review Actions

### Key Communications and Coordination Related Actions

| Issue   | Corrective Action  | Status   |
|---|--|----------|
| Delayed internal stakeholder involvement in anticipation of quickly evolving emergent grid events.                                    | Create method to quickly gather all key internal stakeholders before/during quickly evolving emergent grid events.     | Complete |
| Internal communication of changes to grid conditions not agile enough to provide timely updates to community and regulatory relations | Establish efficient mechanism to promptly communicate changes to grid conditions to all internal/external stakeholders | Complete |

## System Operations - Post-Event Review Actions

### Key Training Related Actions

| Issue  | Corrective Action   | Status                                |
|--|---|---------------------------------------|
| GLRP operations-focused training occurs annually but does not incorporate other internal stakeholders in training. | Establish annual Cold Weather Load Shed Tabletop Drill including all key GLRP stakeholders  | Complete                              |
| WSE lessons learned identified with opportunities to improve internal load shed training.                          | Incorporate identified training lessons learned to Energy Control Center (ECC) and Distribution Control center (DCC) integrated training on load shed events. | In Progress:<br>On-going improvements |

# Generation | Preston Gillespie

---





## Generation - Post-Event Review Actions

### Winter Storm Elliott Key Corrective Actions

- Generation common causes included heat trace anomalies and insulation deficiencies
- Improvements include:
  - Heat trace weather hardening projects
    - Critical circuit umbilical cord replacement at Dan River
    - Heat trace monitoring system additions (real-time continuous current measurement with trending / alarming)
  - Insulation repair and improvement actions
    - Insulation repaired at Roxboro, Mayo and Smith on failed circuits
    - Insulation audits and assessments performed (informed by Winter Storm Elliott lessons learned)
- Grid reliability evaluations trigger earlier commencement of readiness measures in advance of extreme weather

## Generation - Post-Event Review Actions

### Winter Storm Elliott Key Corrective Actions

- Outage season windows refined
  - 2023 Fall Outage Season to conclude by first week of December
- Seasonal readiness coordinator assigned for each facility
- Implementation of operational lessons learned
  - Air dryer preventative maintenance improvements to enhance reliability of air systems in cold weather
  - Implementing transmitter enclosure temperature monitoring for critical control points
  - Evaluating instrumentation reliability actions and impacts on in-service heat trace
  - Training improvements for conducting physical insulation inspections, and heat trace system troubleshooting
  - Measures implemented for topping off reagents, fuel oil, and other commodities in advance of extreme weather

## Generation - Post-Event Review Actions

### Winter Storm Elliott Key Corrective Actions

- External benchmarking
  - Generation Networking Group – Southern Co., TVA, AEP, Dominion
    - Ensure water availability and flow dividers for dual fuel operation of gas turbines
    - Evaluation of impacts to station cooling systems due to extreme weather
    - Operational feasibility assessments performed for combined cycle stations to bypass steam to the condenser when the steam turbine is unavailable
- Nuclear actions
  - Climate projections are one of the inputs into sizing new equipment for planned uprates at multiple sites to increase resiliency
  - Operating experience was incorporated into site-specific cold weather readiness procedures (e.g., insulation lessons learned)

# Customer Delivery, Customer Communications | Eric Grant, Taryn Sims

---



## Customer Delivery - Post-Event Review Actions

### Recap of Rotational Load Shed (RLS) Tool

- Features of RLS
  - Automates megawatt reductions and outage durations
  - Rotates through a set of circuits according to preset priority
  - Targets de-energization for 15-30 minutes
- Different Issues in DEC and DEP on December 24
  - DEC: Latency issue during circuit restoration
  - DEP: Load shed volume overwhelmed the tagging system

**RLS functionality is important to our customers' experience in the event  
Duke Energy needs to reduce load**

## Customer Delivery - Post-Event Review Actions

### RLS Tool Enhancements

- Incorporated software updates to address RLS tool operation for DEC and DEP
  - Established weekly vendor meetings
- Introduced rigorous testing protocols
  - Amplified test duration, MW tested, and number of unique test cases
  - Validated test environments are similar to production
- Enhanced user training on RLS functionality

**Additional touchpoints with RLS vendor and enhanced testing are aimed at ensuring RLS tool reliability**

## Customer Communications - Post-Event Review Actions

- Revised conservation messaging for customers
- Implemented load reduction messaging process to communicate specific reasons for the outage as well as relevant updates – similar to outage alerts and communicated via text, email or outbound call
- Revisited auto-enrollment parameters for proactive outage notifications to increase % of customers participating with the goal of having 90% enrolled by Q4
- Developed a comprehensive plan to educate customers on emergency notifications, proactive outage alerts and outage map messaging

# Appendix

---





# Consolidated Timeline from January 3<sup>rd</sup> presentation to Commission

OFFICIAL COPY

Dec 21 2023

Friday, 12/23



6:00-10:00 PM

Forecast show DEC and DEP can meet demand with reserves tighter than desired (**900MW**, **1100MW**)

Saturday, 12/24



12:00 AM

Due to cold weather Dan River derated resulting in **360MW** loss



5:05 AM

Third Party that provides firm purchase generation tripped resulting in loss of **350MW**



5:00-6:00 AM

Firm Purchases of **400MW** in DEC and **500MW** in DEP cut, DEP Network Customer **305MW** Firm Purchases Cut



2:00-6:00 AM

Roxboro Unit three and Mayo experience derates resulting of a loss of **675MW**



6:00 AM

All resources are committed, and Area Control Error (ACE) continues to grow more negative



6:10-6:25 AM

Initial load shed request from Energy Control Center (ECC) (**400MW** for DEC and **600MW** for DEP)



7:00-7:10 AM

Second load shed request to reduce an additional **600MW** for DEC and **200MW** for DEP



7:35 AM

Automated tool does not respond to additional commands, requiring manual actions (ECC tripped two radial lines)



8:00-9:00 AM

Assessment of system conditions and beginning of restoration manually, ending at 4:00PM


## RRE/Generation

### Recap of Available Generation on December 24, 2022

- No material updates to facts stated in January hearing
- Dec 22 – approximately 89% of our total generation capacity was available (10/11 nuclear units, 13/15 coal units, 8/9 CCs, and all 55 CTs)
- Overall, cold weather protective measures performed well
- In a few instances, insulation and heat tracing did not prevent instrumentation lines from freezing.
- Total generation reduction of ~ 3.6%, around 1,308 MW
- We did not experience any unit or power blocks trips. Losses were the result of derates.
- All generation reductions restored by December 25th

# Customer Communications - Load Reduction Outage Maps

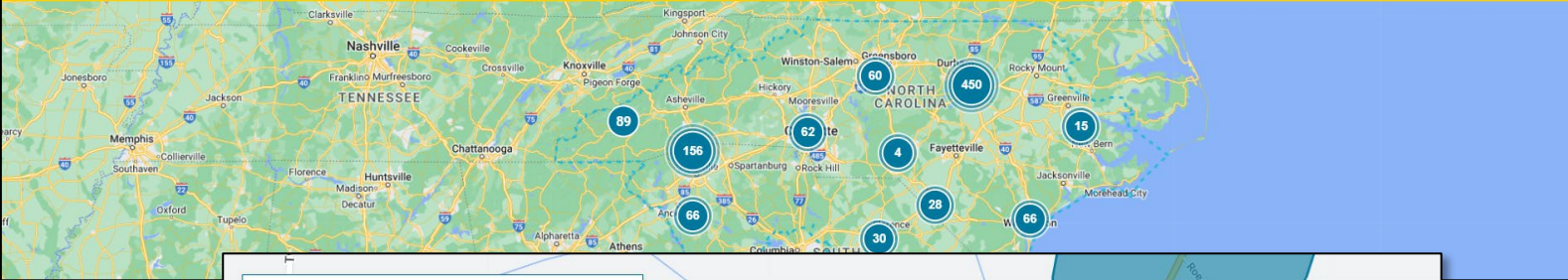
During a load reduction event, the outage map banner will be in place as well as adjustments within the outage event panel view.

 Outages in the Carolinas

Emergency power outages underway | click to expand

Extremely cold temperatures continue to place excessive strain on the grid. As a result, we've begun short, temporary power outages across our system. These emergency outages are necessary to prevent damage to the grid and protect against longer, more widespread outages. The majority of these emergency outages will be short in duration and restored remotely; however, in some cases, a crew will need to be dispatched, extending restoration times. Also, it is possible that other unrelated factors, such as downed tree limbs, vehicular accidents, etc. are also causing outages at the same time. In those instances, we will update the map as our crews provide additional information.

We appreciate your patience and cooperation as we respond to this emergency situation.



### Outage Details

**Estimated Time of Restoration**  
Temporary, rotating outages in progress

**Status**  
Managed remotely at regional Control Center

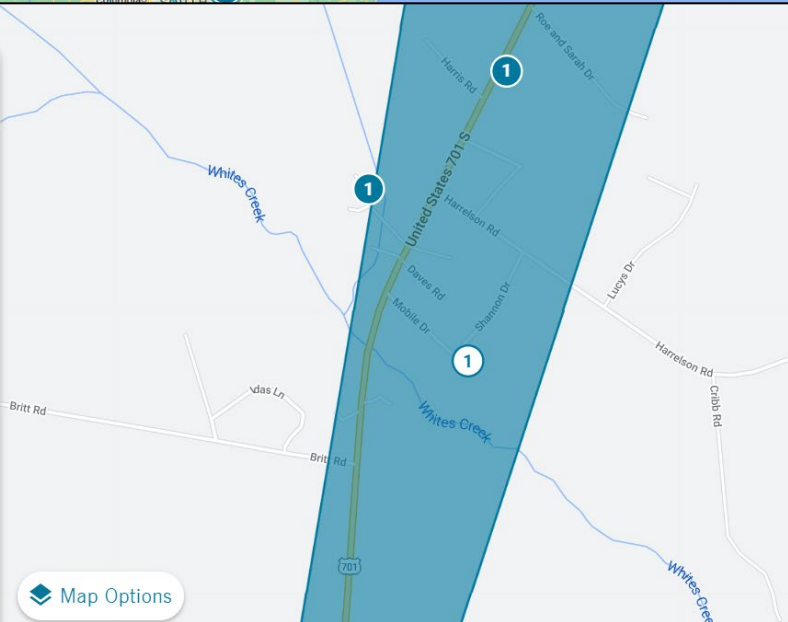
**Cause**  
Grid stabilization

**# Customers Without Power**  
1

**First Reported**  
February 20, 10:36 a.m.

[GET OUTAGE ALERTS](#) [REPORT OUTAGE](#)

Outage information is refreshed every ~15 minutes.  
Last Updated: April 19, 7:16 a.m.



Emergency power outages underway | click to expand

Extremely cold temperatures continue to place excessive strain on the grid. As a result, we've begun short, temporary power outages across our system. These emergency outages are necessary to prevent damage to the grid and protect against longer, more widespread outages. The majority of these emergency outages will be short in duration and restored remotely; however, in some cases, a crew will need to be dispatched, extending restoration times. Also, it is possible that other unrelated factors, such as downed tree limbs, vehicular accidents, etc. are also causing outages at the same time. In those instances, we will update the map as our crews provide additional information.

We appreciate your patience and cooperation as we respond to this emergency situation.

*ILLUSTRATIVE MESSAGE*

Customer Communications - Load Reduction Outage Alerts (Carolinas)

In addition to referencing the outage maps, customers who are enrolled in the outage alerts program are notified via text, e-mail or phone of outages impacting them. During a load reduction event, messaging is sent to customers to communicate specific reasons for the outage as well as updates on status of the outage and restoration. Detailed customer messaging will continue to be refined alongside other ongoing process efforts.

TYPICAL OUTAGE SCENARIO

GLRP Event

| Initial Out  | Cause & Crew Status  | ETR  | Restoration  |
|--|--|--|--|
| <p>Duke Energy: There is a power outage in your area that may impact [123 Main**]. The current estimated time for restoration is [X:XX AM/PM] on [MONTH DAY]. If your service is on, Text 1. If you are without power, there is no need to report it at this time. Visit <a href="http://duk.us/05">http://duk.us/05</a> for updates. Text STOP to prevent all future outage notifications.</p>  | <p>Duke Energy: Outage caused by [CAUSE]. Crew onsite, working to restore. Approx. [# CUSTOMERS IMPACTED] customers affected. Text STOP to cancel.</p> | <p>Duke Energy: The estimated time for power to be on is currently [X:XX AM/PM] on [MONTH DAY] for [123 Main**]; crew working. Outage caused by [CAUSE]. Approx. [# CUSTOMERS IMPACTED] customers impacted. Text STOP to cancel.</p>   | <p>Duke Energy: Repairs are complete in the area of [123 Main**] as of [X:XX AM/PM] on [MONTH DAY]; Outage caused by [CAUSE]. [# CUSTOMERS IMPACTED] customers impacted. If your power is still out, reply OFF. Text STOP to cancel.</p>   |
| <p>Duke Energy: Systemwide energy needs in our region are currently exceeding available resources. As a result, a temporary power outage has been implemented in the area of [13117 BO**]. This brief interruption is necessary to help stabilize the energy grid during a period of high demand. There is no need to report your outage. For additional details visit <a href="http://duk.us/05">duk.us/05</a>. Text STOP to prevent all future outage notifications.' notifications.</p> | <p>No cause or crew update for rolling load shed events unless remote restore fails or the outage is resulting from conventional causes.</p>           | <p>(ETR should not generate unless DCC manually enters an ETR)</p> <p>Duke Energy: The current estimated time for restoration for the power outage affecting [13117 BO**] is now [X:XX AM/PM] on [MONTH DAY]. Delay caused by [CAUSE]. Visit <a href="http://duk.us/05">duk.us/05</a> for more information about this adjusted estimate. Text STOP to prevent receiving all future outage notifications.</p> | <p>Duke Energy: Power is now back on in the area of [13117 BO**] as of [10:43AM] on [Apr 05]. Thank you for your patience. If additional emergency outages are necessary, you will be notified. If for any reason you remain without power, please reply OFF.</p> <p>If reply OFF:</p> <p>Duke Energy: Thank you for your reply. Please confirm your breakers are in the ON position. We will complete a remote diagnostic on your service. If the diagnostics indicate an issue, we will dispatch a crew to ensure your service is properly restored.</p> |

# Customer Communications - Load Reduction Email, Voice and IVR

## Draft Messaging

Customers who are enrolled in the outage alerts program are notified via their preferred channel – IVR and Email examples below. IVR messaging will be placed as indicated below.

### EMAIL



Brief, temporary outages occurring across the region.

Energy needs in our region are currently exceeding available resources. As a result, a temporary power outage has been implemented in the area of %123 Main\*\*%.

This short, emergency outage is necessary to help stabilize the energy grid during a period of high demand. There is no need to report your outage and we will continue to keep you informed.

In the meantime, visit our website for additional information about this event or our [outage map](#) to get the latest updates. We apologize for the inconvenience and thank you for your patience.

GO TO WEBSITE

### IVR



"We are currently implementing short, temporary power outages across our system. These brief service interruptions are needed to help reduce strain on the energy grid and ensure stabilization during this period of excessively high demand. If you are currently experiencing an interruption of service, there is no need to report it at this time. These rotating outages are temporary and will be restored shortly. We appreciate your patience as we respond to this emergency situation".

### VOICE



#### Initial Out

"This is an important update from Duke Energy. Systemwide energy needs in our region are currently exceeding available resources. As a result, a temporary power outage has been implemented in the area of [123 Main \*\*]. This brief interruption is necessary to help stabilize the energy grid during a period of high demand. There is no need to report your outage at this time. Visit duke dash energy dot com slash outage map for the latest updates. Press pound to hear this message again."

#### Restoration

This an important outage update from Duke Energy. Power is now back on in the area of [123 Main\*\*] as of [X:XX a.m./p.m]. Thank you for your patience. If additional emergency outages are necessary, you will be notified. If for any reason you remain without power, please press 2. Press pound to hear this message again.

#### If press 2:

Thank you for your reply. Please confirm your breakers are in the ON position. We will complete a remote diagnostic check of your service. If the diagnostics indicate an issue, we will dispatch a crew to ensure your service is properly restored.



## Duke Energy Updates

The extremely low temperatures and high energy demand continue to place an unusual strain on the energy grid. Please consider powering down all nonessential electric devices and delaying unnecessary energy use for the next 24-48 hours to help avoid rotating outages.

Customers can help us by taking the following steps:

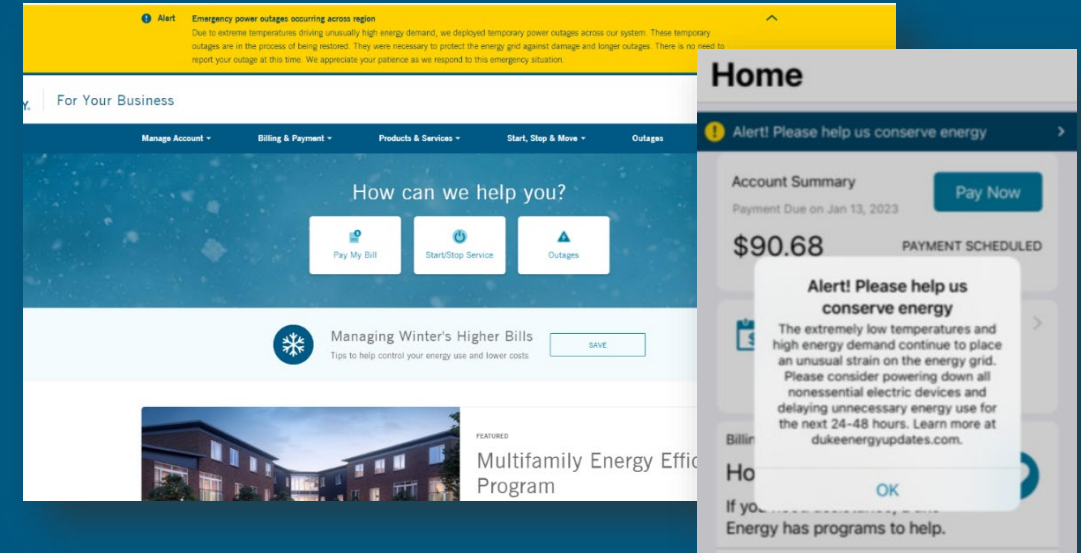
- Select the lowest comfortable thermostat setting and bump it down several degrees whenever possible.
- Avoid using large appliances – this means appliances with a three-pronged plug, such as dishwashers, ovens and dryers – during high-demand periods like early winter mornings.
- Shift nonessential activities, like laundry, to late evening hours, when power demand is lower.
- Charge electric vehicles overnight.
- If you have an electric water heater, limit the use of hot water as much as possible.

Emergency power outages were implemented on Saturday, Dec. 24. [Learn more](#) about what led to these actions.

## DUKE ENERGY WEB UPDATES

A web page is created for each event to provide:

- Information about the event
- Actions customers can take
- FAQs



## DIGITAL BANNERS

Digital banners are placed on DE.com and on the mobile app to provide customer with additional information.

CERTIFICATE OF SERVICE

I certify that a copy of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's Presentation from the September 26, 2023 Winter Storm Elliott Technical Conference, in Docket No. M-100 Sub 163, has been served by electronic mail, hand delivery, or by depositing a copy in the United States Mail, 1<sup>st</sup> Class Postage Prepaid, properly addressed to parties of record.

This the 21<sup>st</sup> day of December, 2023.



---

Jason A. Higginbotham  
Associate General Counsel  
Duke Energy Corporation  
525 S. Tryon Street, ECA3  
Charlotte, NC 28202  
Tel 704.731.4015  
[Jason.Higginbotham@duke-energy.com](mailto:Jason.Higginbotham@duke-energy.com)