

# Findings from Level 3 Essential Actions for Cold Weather Preparations for Extreme Cold Weather Events Alert

November 6, 2023

## Overview

NERC issued a Level 3 Essential Actions for Cold Weather Preparations for Extreme Weather Events III alert in May 2023 to support readiness and assess the extent of condition of the Generator Operator (GO), Transmission Operator (TOP), Balancing Authority (BA), and Reliability Coordinator (RC) readiness and enhanced plans for, and progress toward, mitigating risk for Winter 2023-2024 and beyond.

As the November 2021 FERC/NERC joint inquiry report into the causes of the February 2021 cold weather event (Winter Storm Uri) found, the bulk power system (BPS) cannot operate reliably without adequate generation. During these events, several RCs declared Emergency Energy Alerts (EEA3) and implemented firm load shed to help mitigate the loss of generation due to forced outages. The higher-than-expected load and forecasting errors led to grid operators shedding firm load to prevent uncontrolled load shedding and cascading outages. Events of this magnitude may result in major disruptions and have very real human consequences.

The alert was posted publicly on NERC's website and required GOs, TOPs, and BAs to answer 20 questions.<sup>1</sup> The first 16 questions were directed exclusively to GOs; one question each directed to TOPs and Bas; and the final two were for all recipients. The questions were intended to increase readiness and gather information about the extent of condition around GO, TOP, BA, and RC current-status, plans, and progress toward mitigating risk for the upcoming winter and beyond. Additionally, GOs were required to provide a supplemental Data Submission Worksheet<sup>2</sup> to gather additional supporting information.

The deadline for submission of all required items was October 6, 2023. The information contained in this report highlights the key findings to date from the analysis conducted by NERC staff.

## Summary

The GO, TOP, and BA entities were informed of 8 Essential Actions that should be performed and required to answer 20 questions. Key elements in assessing the extent of condition included whether the GO had:

- Completed a study to determine the generating units' Extreme Cold Weather Temperature (ECWT)
- Identified its Generator Cold Weather Critical Component (GCWCC).
- Determined which units are capable of operating at or below the ECWT.

<sup>1</sup> [Cold Weather Preparations for Extreme Weather Events III](#)

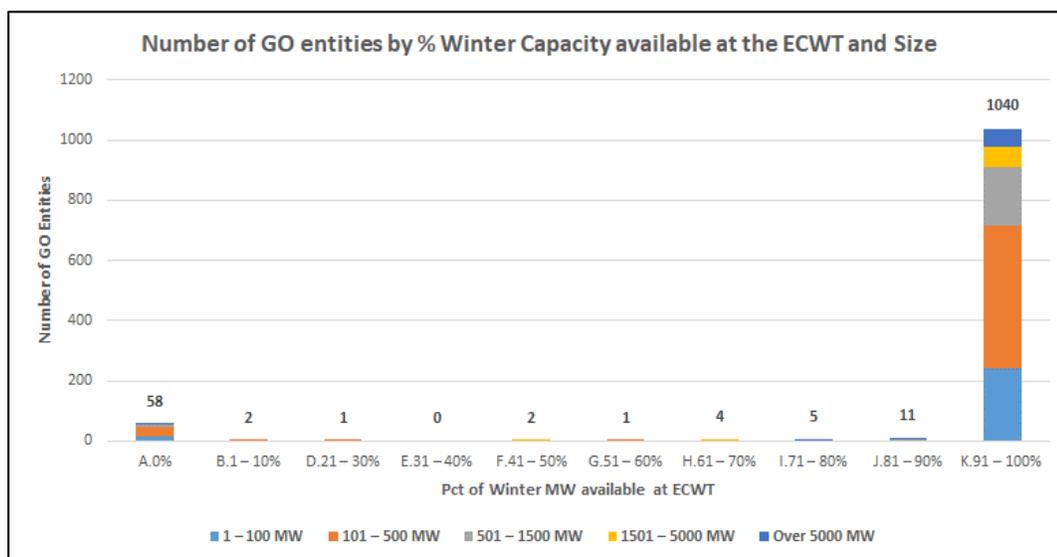
<sup>2</sup> <https://www.nerc.com/pa/rrm/bpsa/Alerts%20DL/Data%20Submission%20Worksheet%20-%20Cold%20Weather%20Level%203v2.xlsx>

- Identified which units experienced a Generator Cold Weather Reliability Event (GCWRE) in the prior winter and whether any corrective actions were taken.

## Key Findings

The following is a summary of the key findings to date:

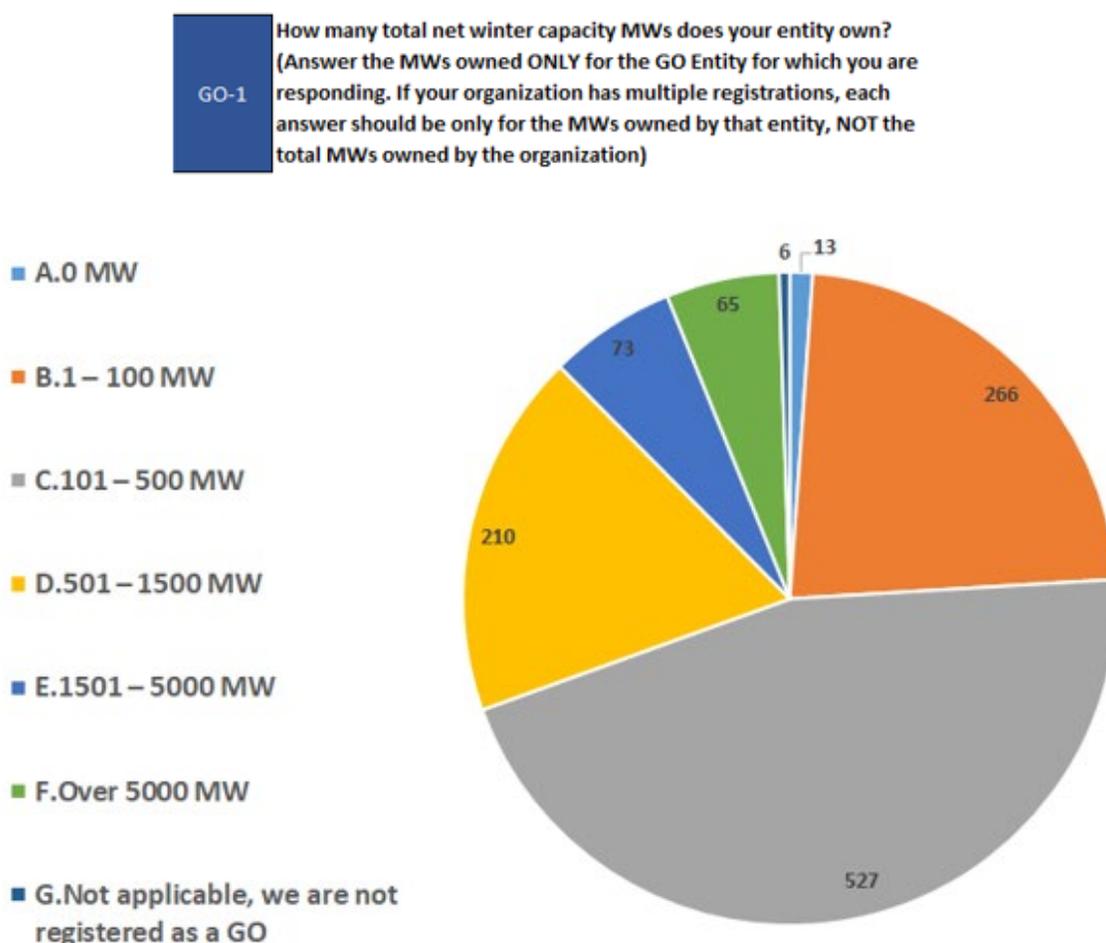
- Responses indicated that freezing conditions remain a reliability issue for generators. Some of the recurring concerns included improper heat trace, frozen instrumentation, frozen transmitters, control valves, lack of fuel supply, fuel jelling, blade icing, and breakers tripping caused by low temperature and low air pressure. Low temperatures and freezing conditions also caused generators to derate units and in some cases caused forced outages due to equipment failure in the freezing conditions.
- The vast majority of GOs (96%) responded that they have calculated, or will expect to calculate, an ECWT for all of their owned capacity. The 96% included almost every larger entity (>1500 self-reported MW). It is encouraging that entities had made efforts to determine the ECWT before the winter season. Also, the overwhelming majority of GOs responded that 91-100% of their capacity would be capable of operating at the ECWT. Based on limited follow up analysis, the 58 entities that reported that 0% of their capacity would be available at the ECWT appear to be mostly wind farms in this category. This is another very encouraging sign with respect to generator preparedness.



- A relatively small number of GO entities (62) indicated in question GO-15 that most of their capacity that experienced a cold weather reliability event in Winter 2022-2023 were vulnerable to being impacted by the same cause in Winter 2023-2024 due to known issues that cannot or will not be mitigated. The vast majority of these entities were wind farms that listed some variant of blade icing as the cause of the prior event. Quantification of the risk presented by wind farms in winter months warrants additional investigation.

- 4) Approximately 70% of both TOPs and BAs expect to have updated operating plans prior to Winter 2023-2024. While some (7% and 17% respectively) appear to have a valid reason for not doing so, the underlying reason why some TOPs and BAs are not updating operating plans warrants additional investigation.

The following graphs and tables show a breakdown of the responses to selected alert questions. The responses included in the tables and charts were the responses submitted by the targeted Functional Group, e.g., the GO-1 responses were only collected from entities registered as GOs. Responses from TOPs and BAs which are not registered as GOs (which we would expect to be “Not Applicable”) would be excluded from the GO-1 tables and charts.<sup>3</sup>

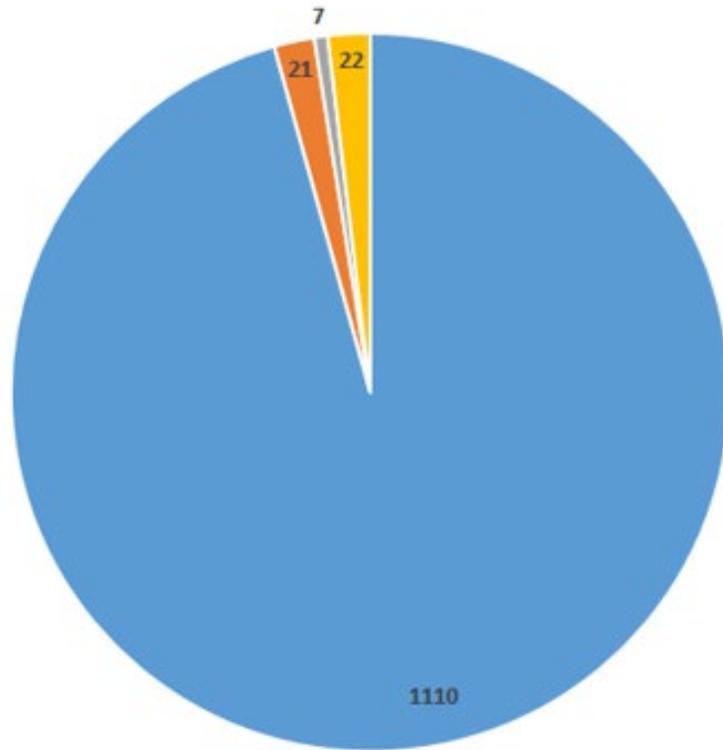


<sup>3</sup> NERC is aware that a very small number of GO entities incorrectly stated that they were not GOs. NERC will follow up with entities and investigate the causes of the error to the extent necessary.

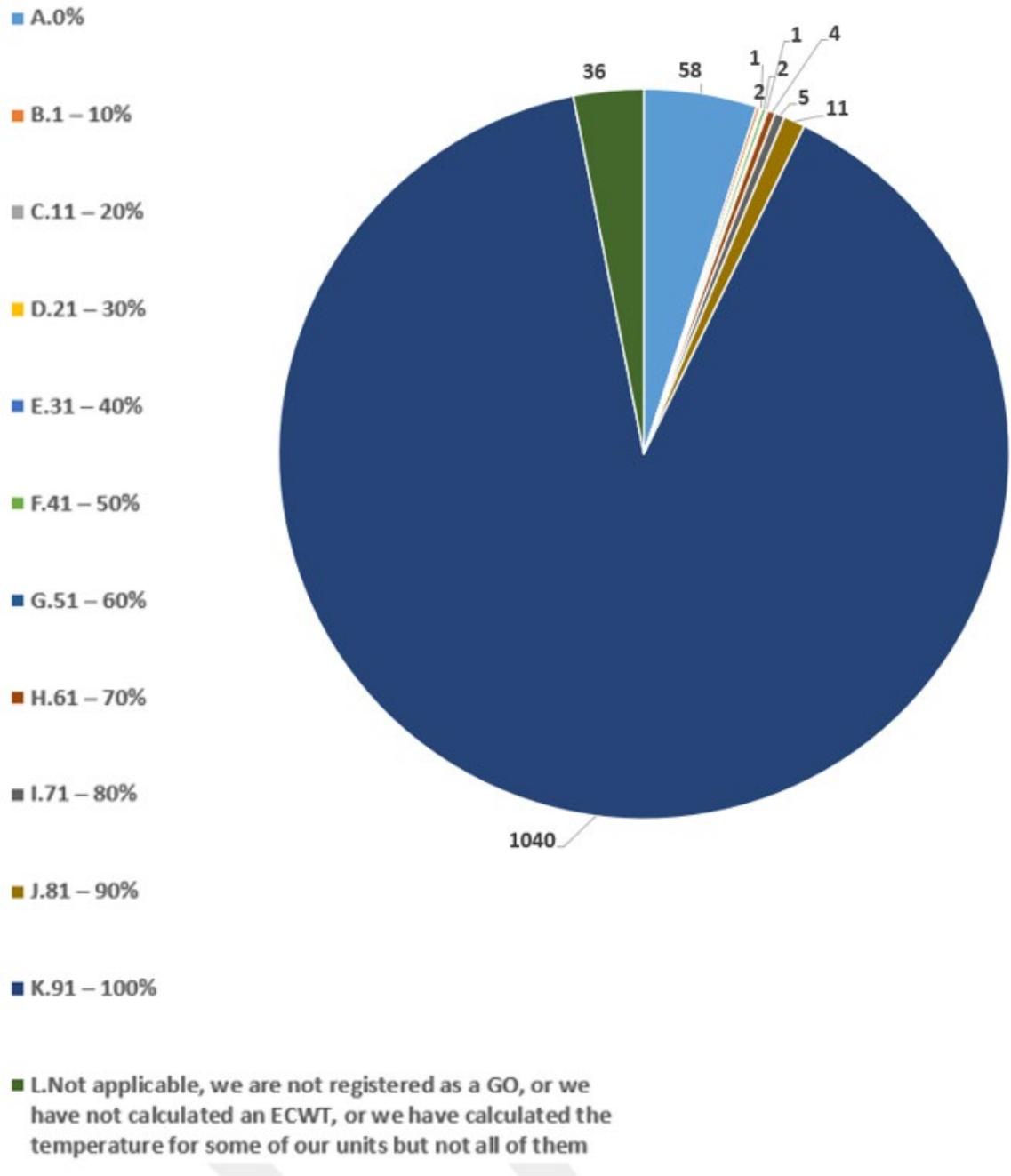
GO-3

Have you calculated, or expect to calculate prior to the 2023–2024 winter season, an ECWT (as described in Essential Action 1) for some or all of your units?

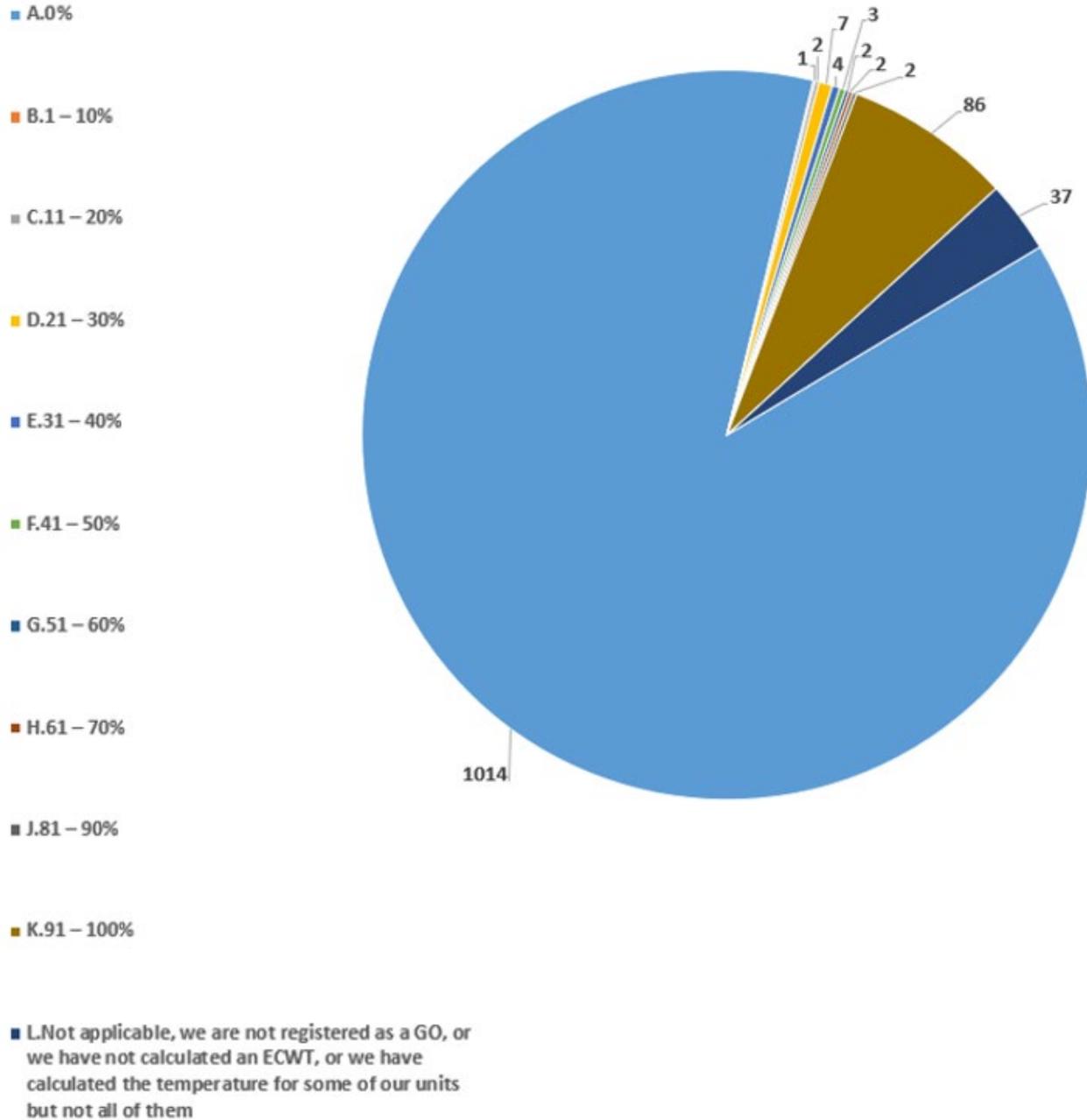
- A. Yes, we have calculated, or expect to calculate, an ECWT for all of our units
- B. Yes, we have calculated, or expect to calculate, an ECWT for some, but not all of our units
- C. No, we have not performed this calculation and have no plans to perform this calculation
- D. Not applicable, we are not registered as a GO or we have not calculated an ECWT



**GO-4** What percentage of your net winter capacity MWs are capable of operating at the ECWT at their location?



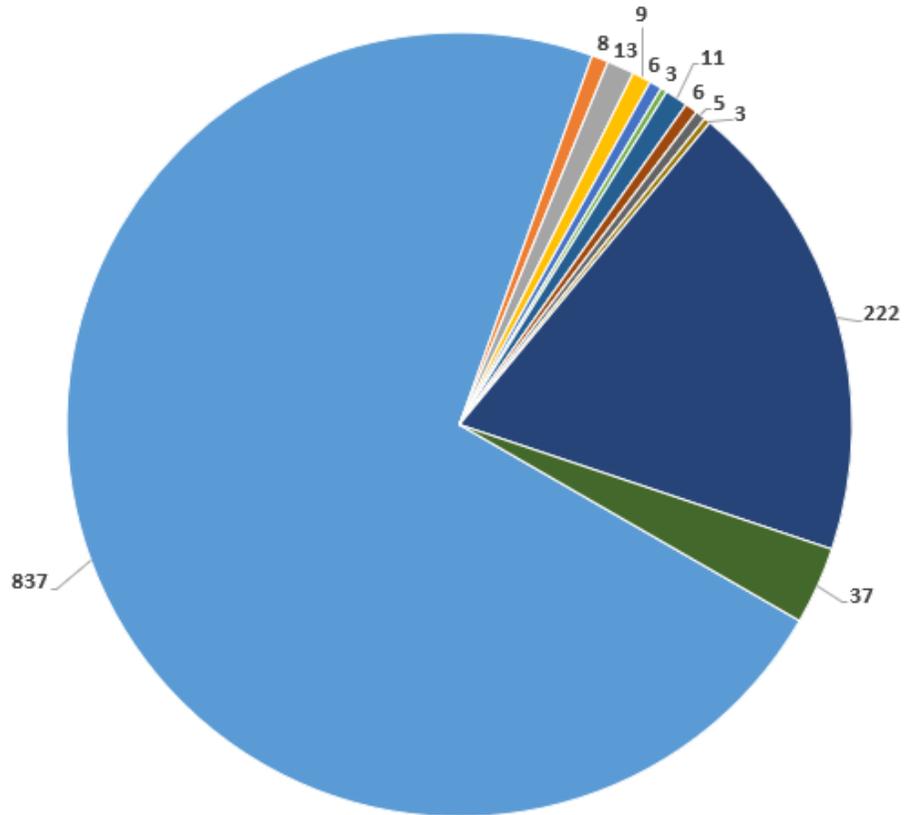
**GO-5** What percentage of your net winter capacity MWs are assessed as having an ECWT above 32 °F?



GO-6

What percentage of your net winter capacity MWs are assessed as having an ECWT between 31°F and 20 °F?

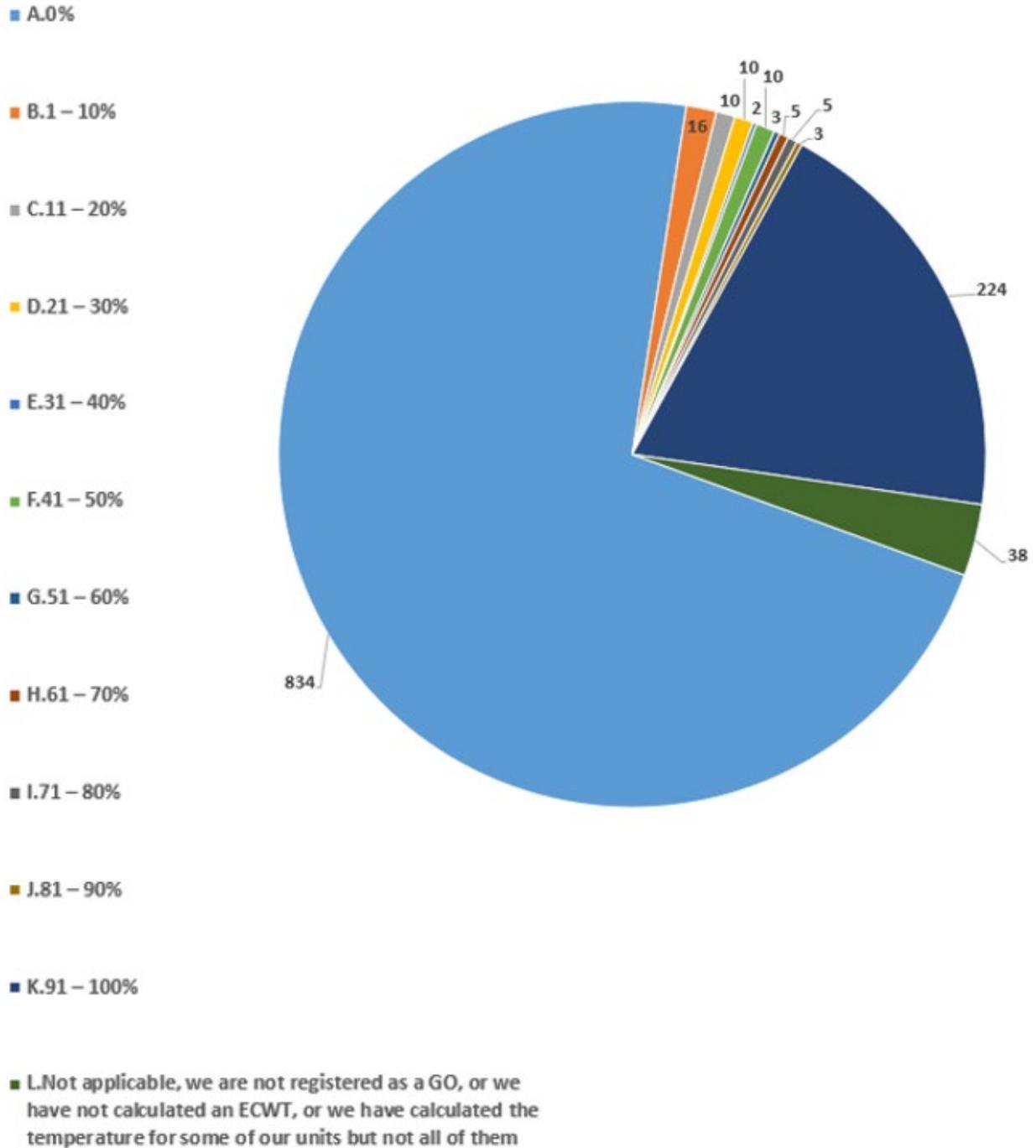
- A.0%
- B.1 – 10%
- C.11 – 20%
- D.21 – 30%
- E.31 – 40%
- F.41 – 50%
- G.51 – 60%
- H.61 – 70%
- I.71 – 80%
- J.81 – 90%
- K.91 – 100%



■ L. Not applicable, we are not registered as a GO, or we have not calculated an ECWT, or we have calculated the temperature for some of our units but not all of them

GO-7

What percentage of your net winter capacity MWs are assessed as having an ECWT between 19°F and 10 °F?



GO-8

What percentage of your net winter capacity MWs are assessed as having an ECWT between 9°F and 0 °F?

A.0%

B.1 – 10%

C.11 – 20%

D.21 – 30%

E.31 – 40%

F.41 – 50%

G.51 – 60%

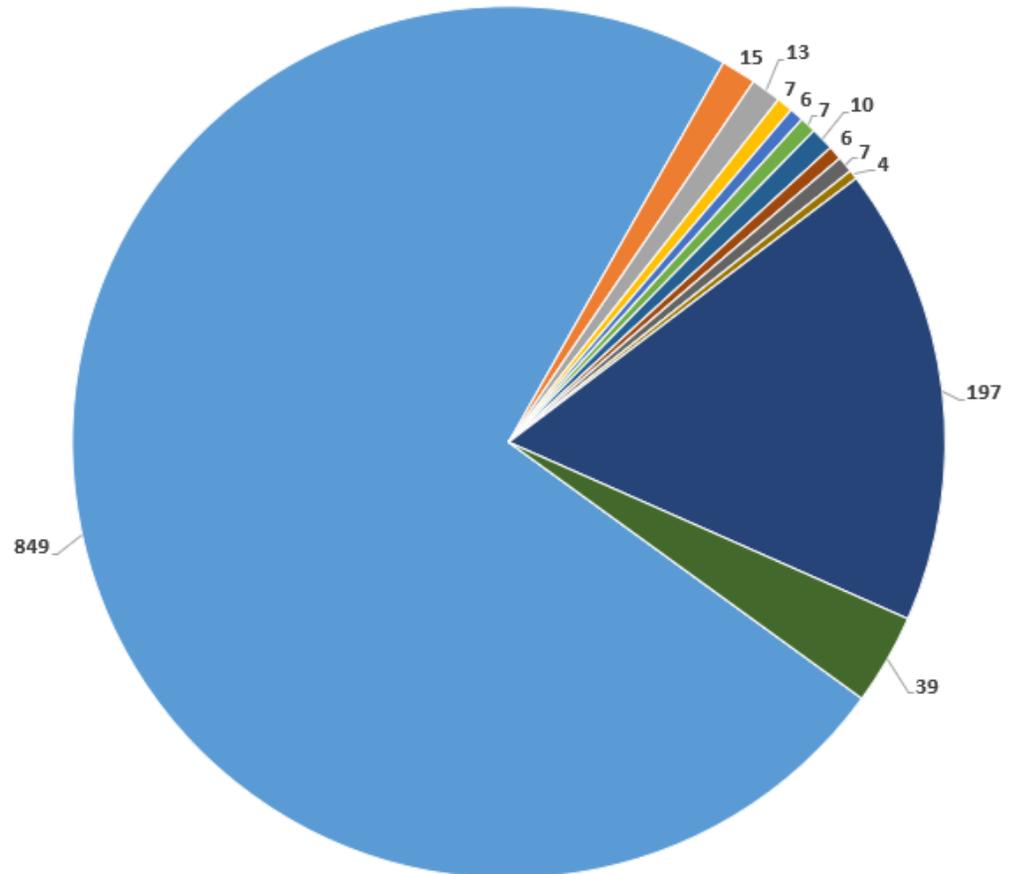
H.61 – 70%

I.71 – 80%

J.81 – 90%

K.91 – 100%

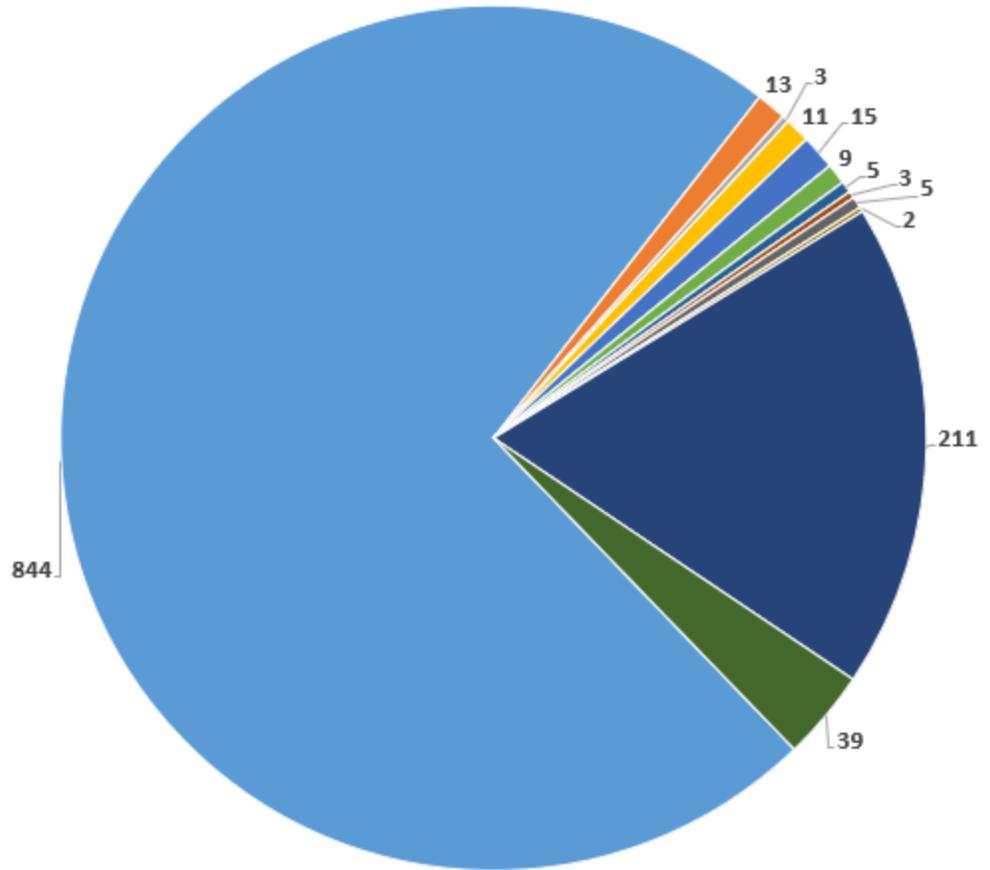
L. Not applicable, we are not registered as a GO, or we have not calculated an ECWT, or we have calculated the temperature for some of our units but not all of them



GO-9

What percentage of your net winter capacity MWs are assessed as having an ECWT between -1°F and -10 °F?

- A.0%
- B.1 – 10%
- C.11 – 20%
- D.21 – 30%
- E.31 – 40%
- F.41 – 50%
- G.51 – 60%
- H.61 – 70%
- I.71 – 80%
- J.81 – 90%
- K.91 – 100%

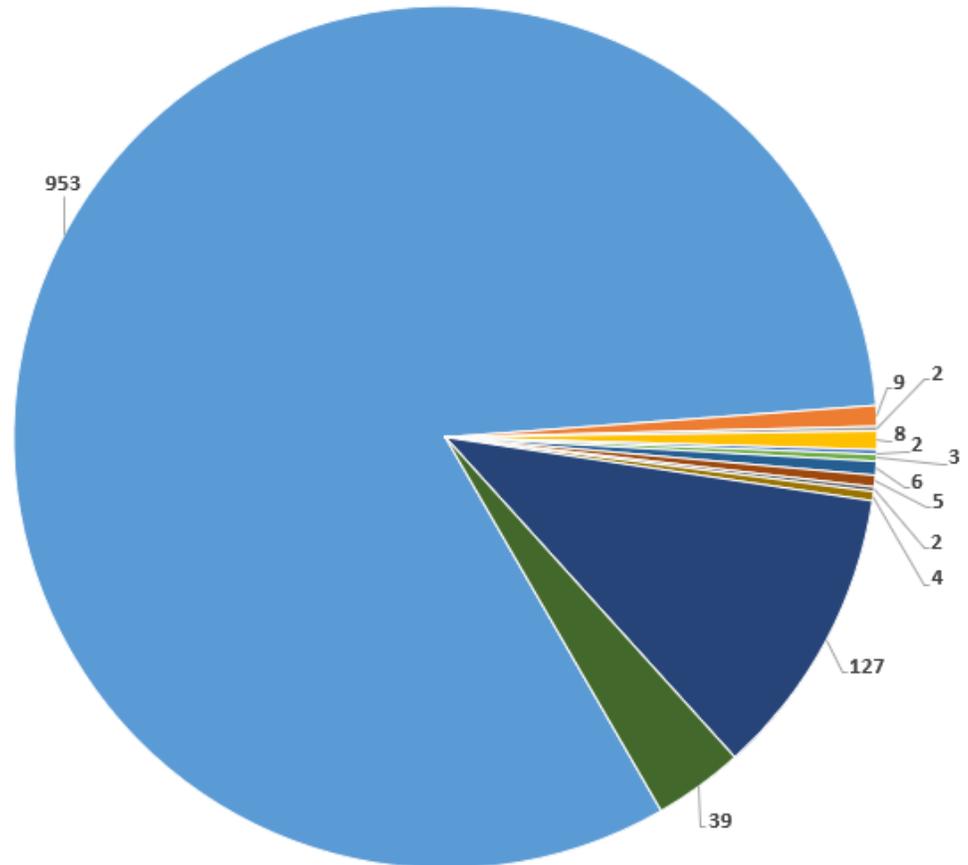


■ L. Not applicable, we are not registered as a GO, or we have not calculated an ECWT, or we have calculated the temperature for some of our units but not all of them

GO-10

What percentage of your net winter capacity MWs are assessed as having an ECWT between -11°F and -20 °F?

- A.0%
- B.1 – 10%
- C.11 – 20%
- D.21 – 30%
- E.31 – 40%
- F.41 – 50%
- G.51 – 60%
- H.61 – 70%
- I.71 – 80%
- J.81 – 90%
- K.91 – 100%

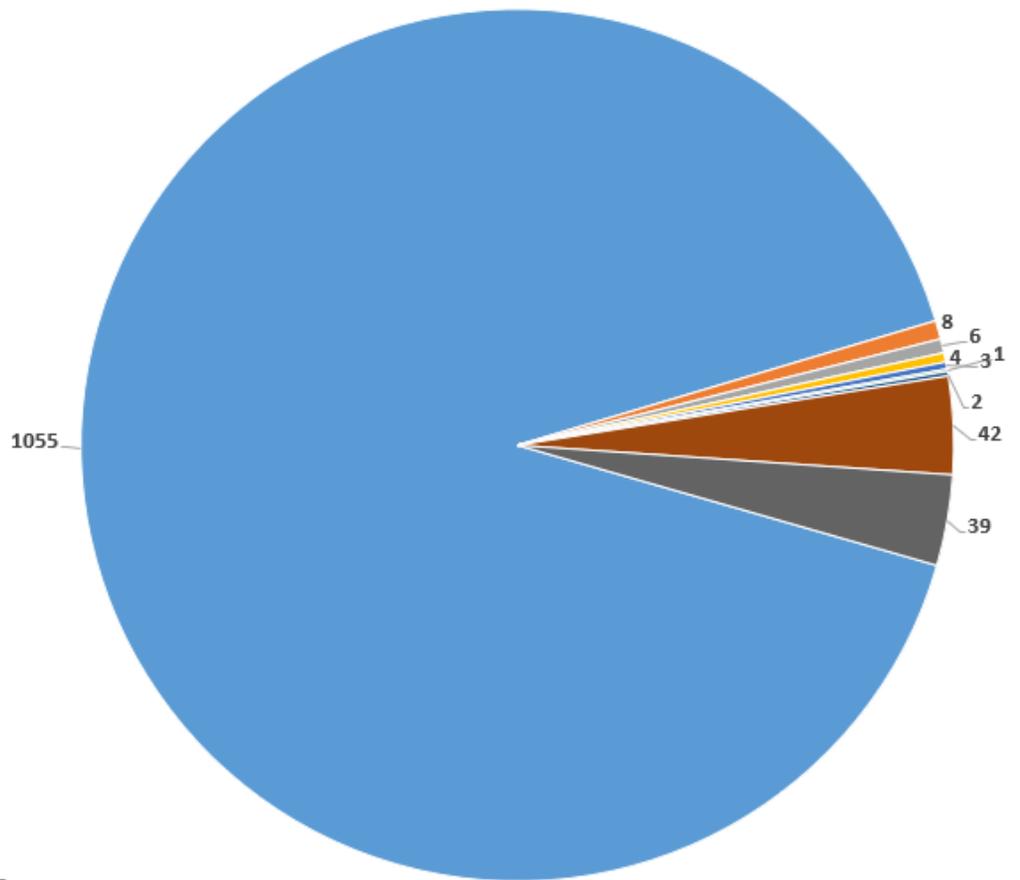


■ L. Not applicable, we are not registered as a GO, or we have not calculated an ECWT, or we have calculated the temperature for some of our units but not all of them

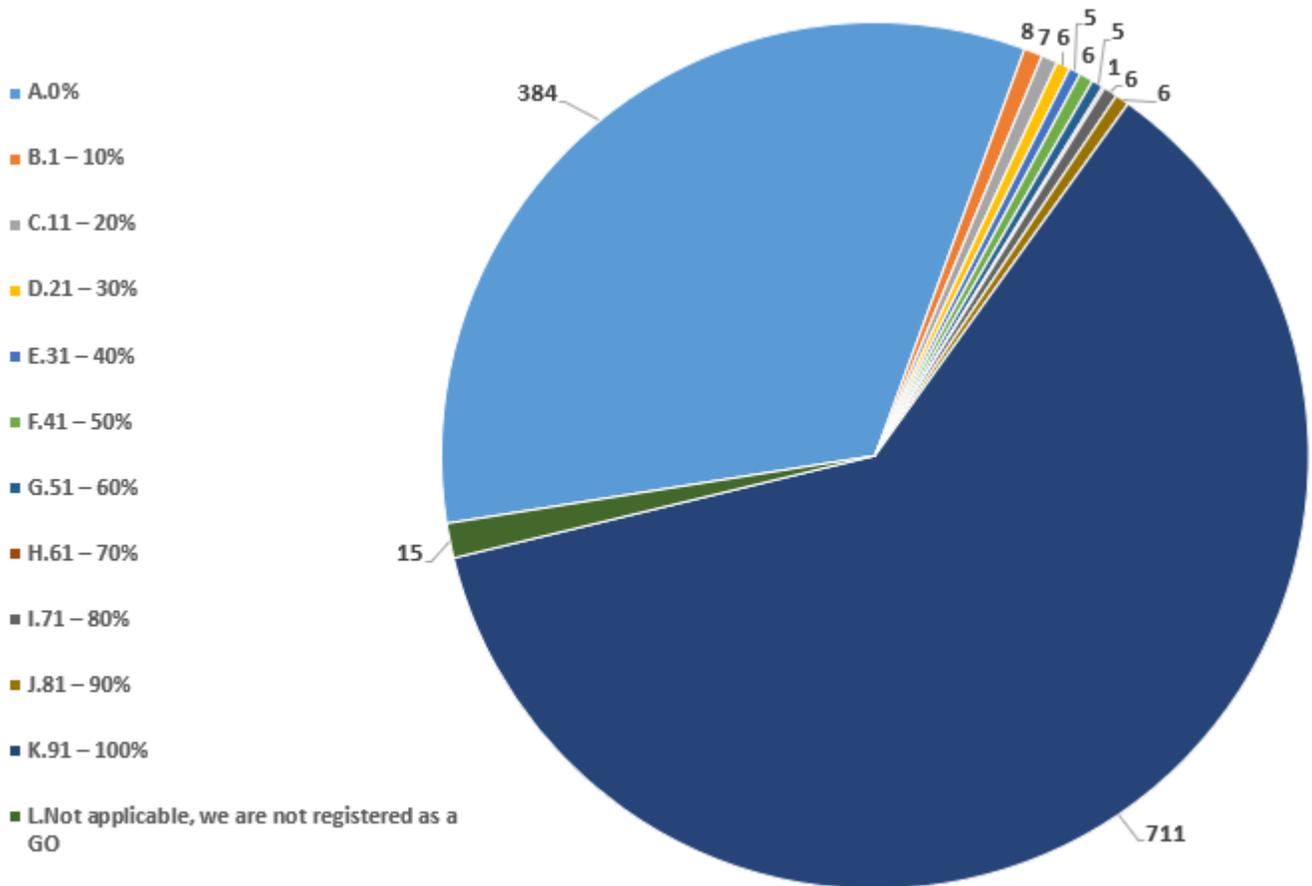
**GO-11** What percentage of your net winter capacity MWs are assessed as having an ECWT below -20 °F?

- A.0%
- B.1 – 10%
- C.11 – 20%
- D.21 – 30%
- E.31 – 40%
- H.61 – 70%
- I.71 – 80%
- K.91 – 100%

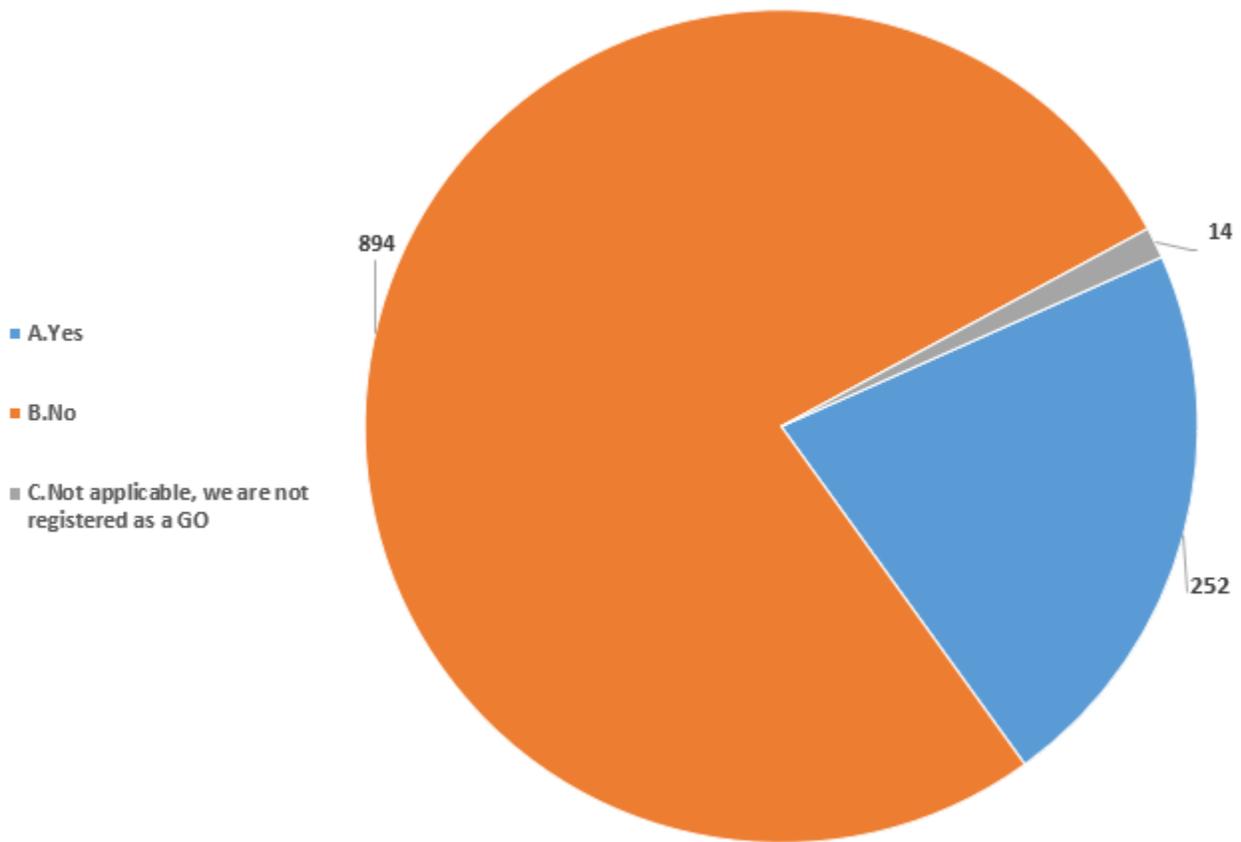
■ L. Not applicable, we are not registered as a GO, or we have not calculated an ECWT, or we have calculated the temperature for some of our units but not all of them



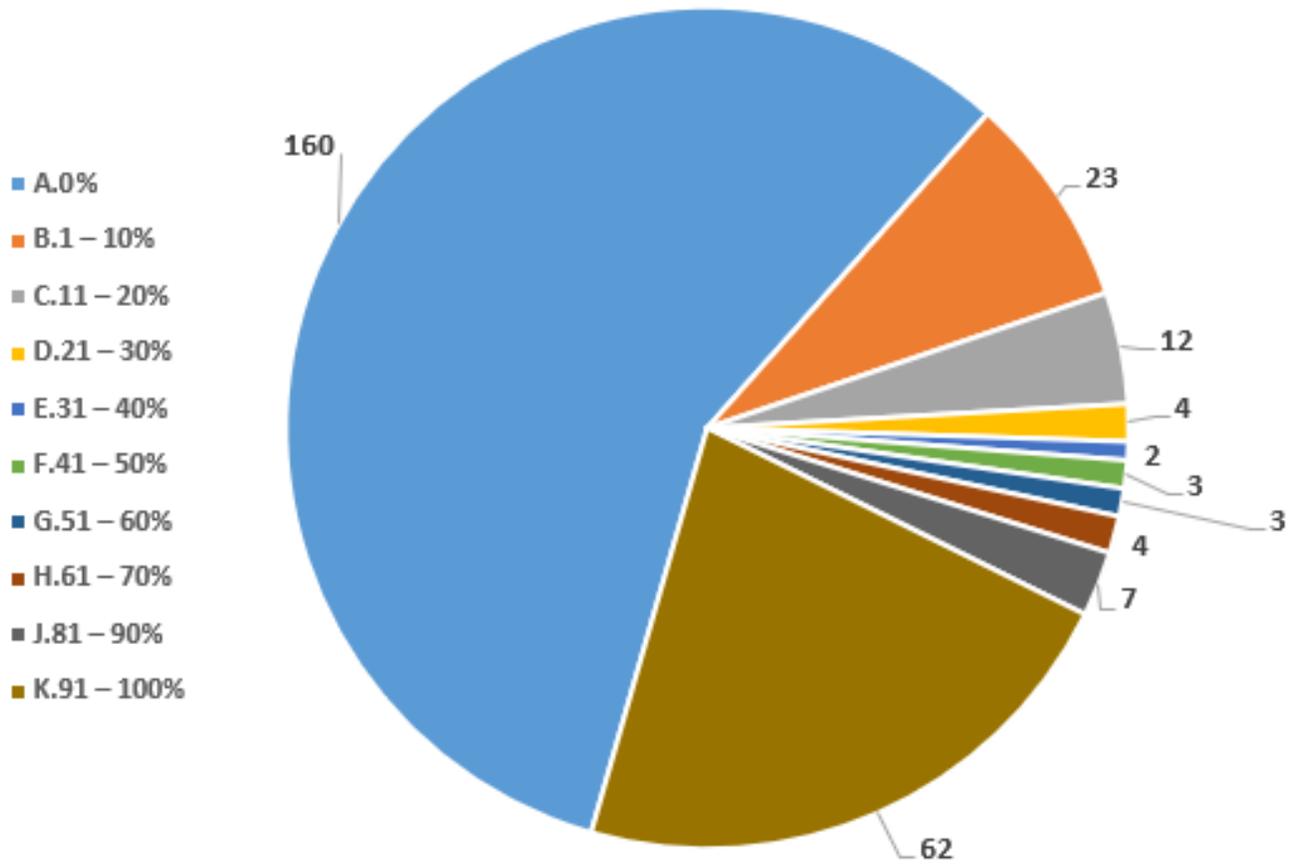
**GO-12** For what percentage of your net winter capacity MWs have you identified as the Generator Cold Weather Critical Components as described in Essential Action #2?



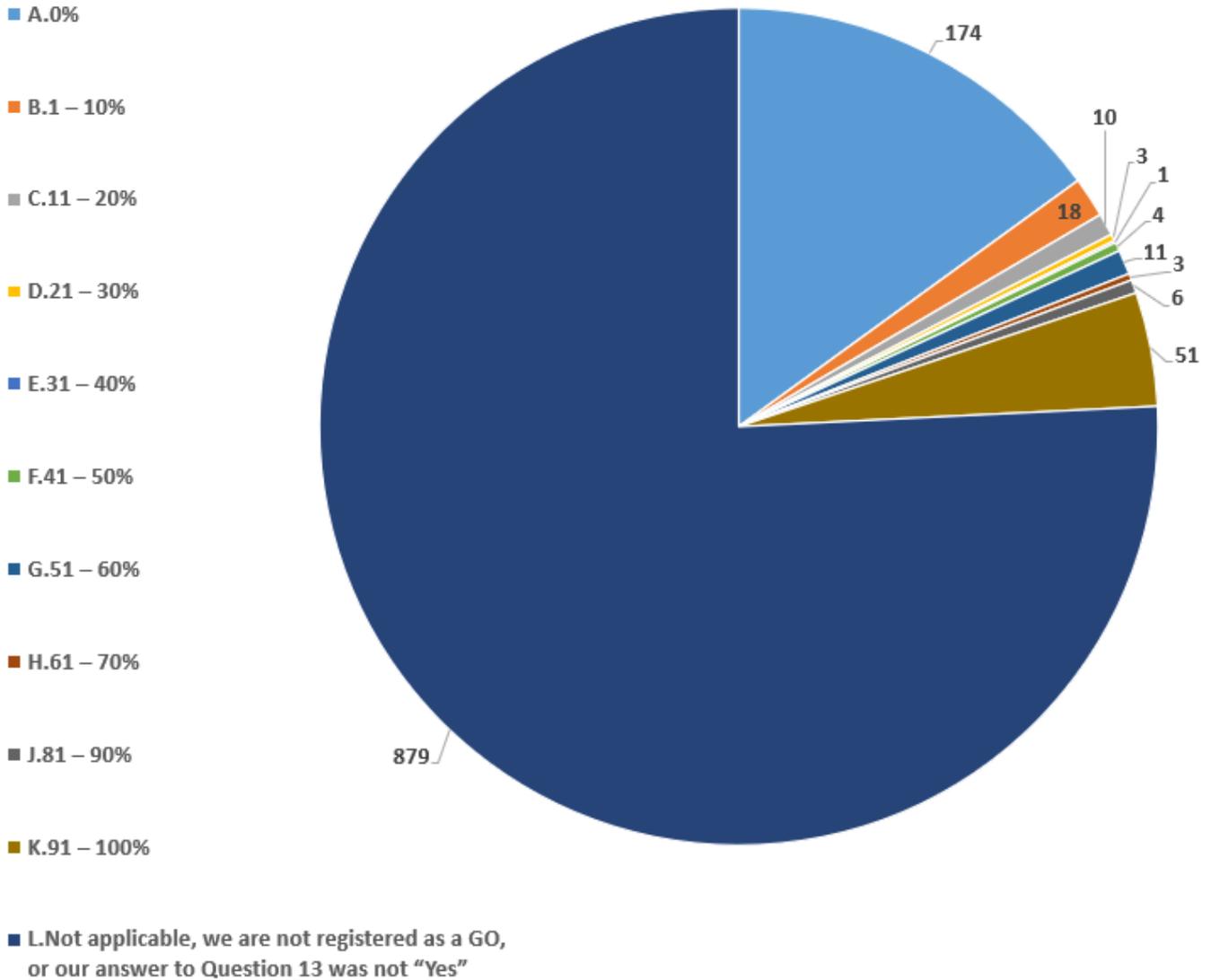
**GO-13** Did any of your units experience a Generator Cold Weather Reliability Event(s) in the 2022–2023 winter season as described in Essential Action #4?



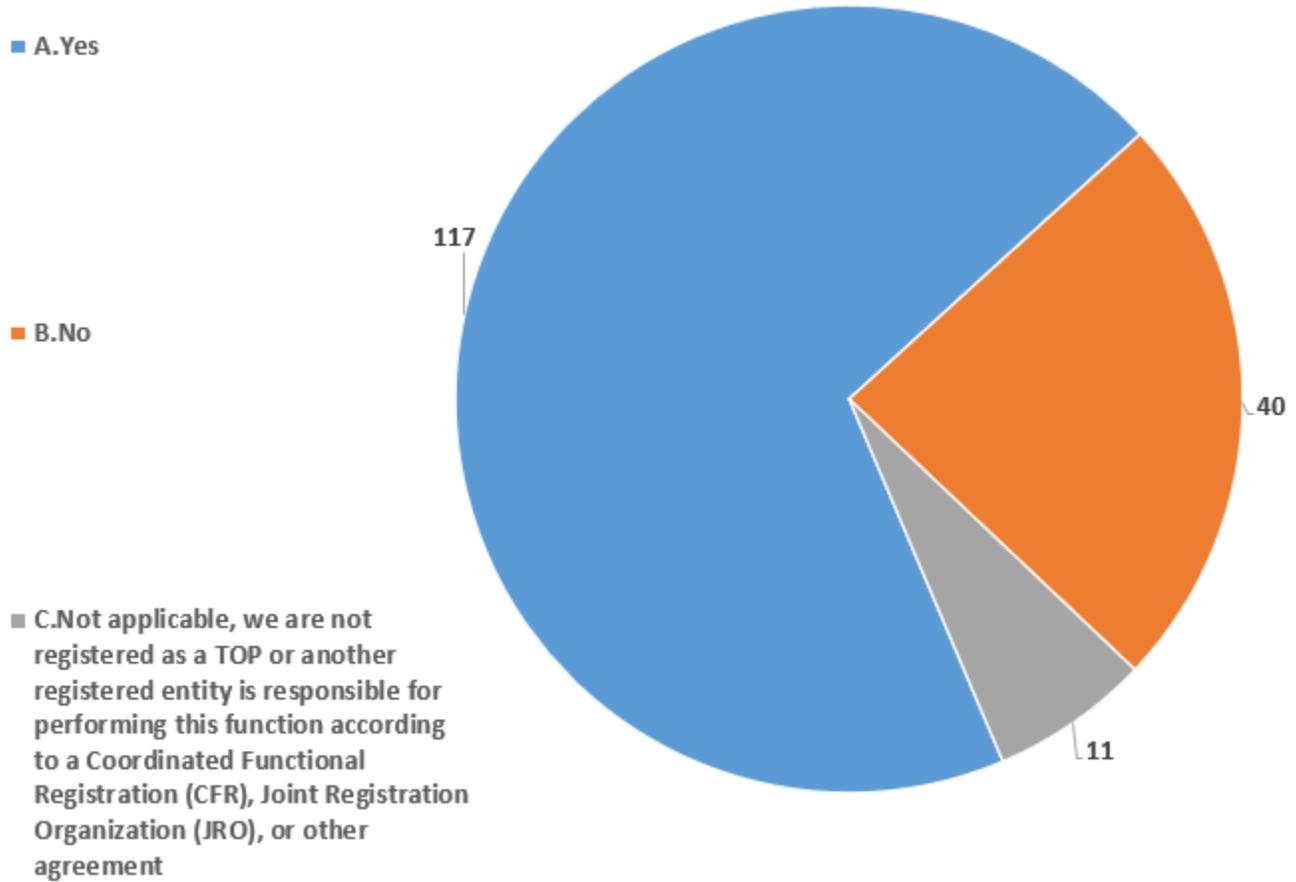
**GO-15** If your answer to Question 13 was “Yes,” what percentage of your net winter capacity MWs do you consider to be at risk of being impacted by the same cause(s) for the upcoming 2023–2024 winter season? (due to a known limitation or issue not mitigated by that time)



**GO-16** If your answer to Question 13 was "Yes," what percentage of your net winter capacity MWs do you consider to be at risk of being impacted by the same cause(s) for the 2024–2025 winter season? (due to a known limitation or issue not mitigated by that time)



**TOP-17** Have you updated, or expect to update prior to the 2023–2024 winter season, your Operating Plans as described in Essential Action #5?

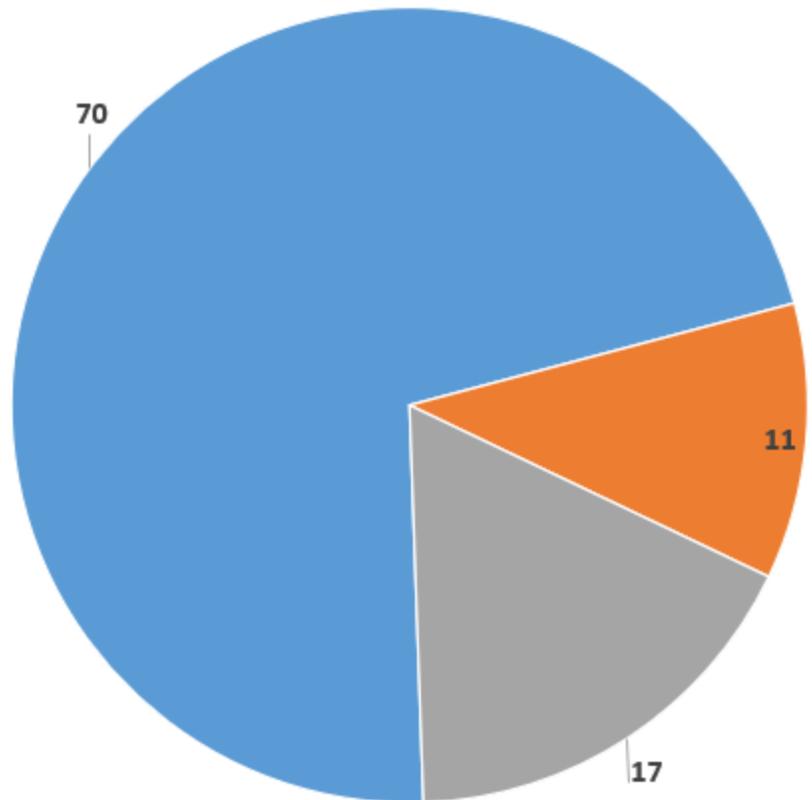


**BA-18** Have you updated, or expect to update prior to the 2023–2024 winter season, your Operating Plans as described in Essential Action #6?

■ A.Yes

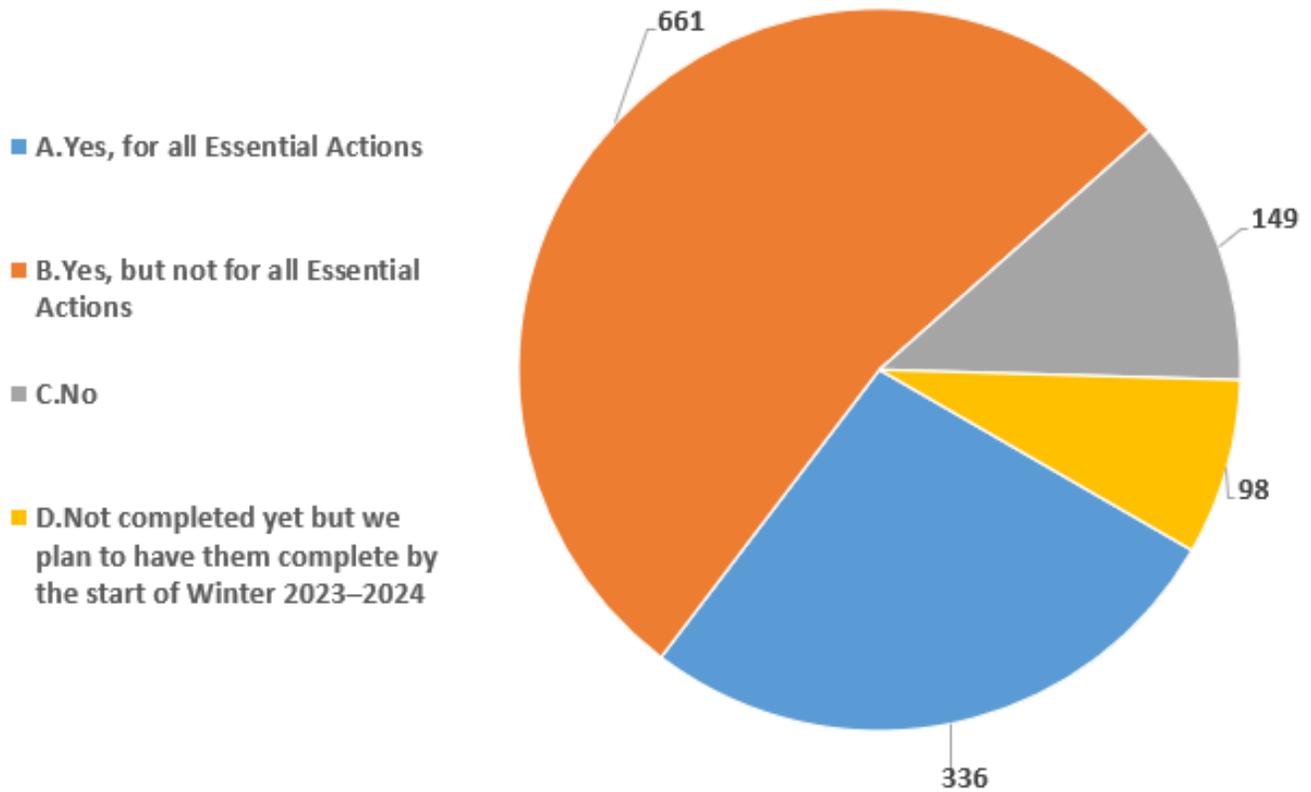
■ B.No

■ C.Not applicable, we are not registered as a BA or another registered entity is responsible for performing this function according to a Coordinated Functional Registration (CFR), Joint Registration Organization (JRO), or other agreement



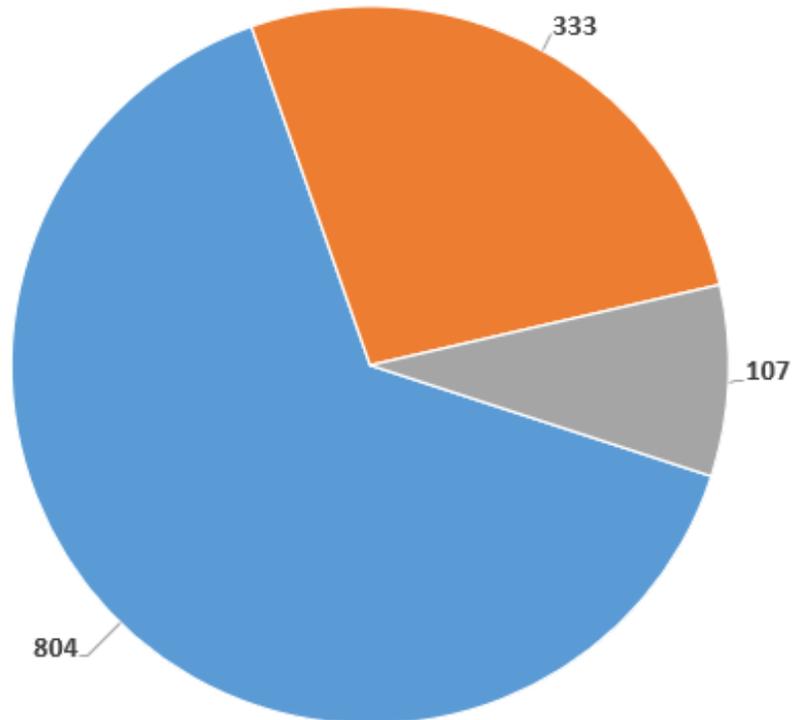
ALL-19

Did you voluntarily complete any of the Essential Actions listed above for Winter 2022–2023?



**ALL-20** If you did not complete all or some of the Essential Actions prior to Winter 2022–2023, will you complete the outstanding Essential Actions for Winter 2023–2024?

- A. Yes, and we plan to complete all the outstanding Essential Actions prior to Winter 2023–2024
- B. Yes, and we will start working on some or all of the Essential Actions prior to Winter 2023–2024 but are not likely to complete all by that time
- C. No, and we have no plans to work on the Essential Actions prior to Winter 2023–2024



## Next Steps

To further address the impacts of Extreme Cold Weather, NERC developed Cold Weather Reliability Standards EOP-011-2, TOP-003-5, and IRO-010-4, which became effective on April 1, 2023. FERC recently approved the revised and new Cold Weather Reliability Standards EOP-011-3 and EOP-012-1, with EOP-012-1 to become effective October 1, 2024; NERC is currently developing revisions to the EOP-012 standard consistent with FERC’s directives in the approval order. In addition, NERC recently filed for FERC approval proposed Reliability Standards EOP-011-4 and TOP-002-5.

NERC will continue to address significant risks to BPS reliability, ensuring that industry is well informed by providing unique and valuable information for asset owners and operators.