

**Testimony of David S. Ortiz, Ph.D.**

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**Before the Committee on Energy and Natural Resources**

**United States Senate**

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Introduction

Chairman Murkowski, Ranking Member Cantwell, and Members of the Committee, thank you for the opportunity to testify today. My name is David Ortiz. I am the Acting Director of the Office of Electric Reliability (OER) of the Federal Energy Regulatory Commission (FERC or Commission). I am here today as a Commission staff witness and my remarks do not necessarily represent the views of the Commission or any individual Commissioner.

Today, my testimony will provide a brief overview of the Commission's activities to implement its authorities over reliability. Then I will summarize recent work carried out by OER in collaboration with the North American Electric Reliability Corporation and its Regional Entities that assessed how utilities develop and test plans to restore the grid after a blackout, focusing on blackstart.

FERC's Authority to Oversee Reliability

In the Energy Policy Act of 2005, Congress gave the Commission the authority to oversee the development and enforcement of mandatory reliability standards for the Bulk-Power System. The authority pertains to the interconnected electricity system (the "grid") in the United States, and excludes Alaska, Hawaii, and local distribution systems.

Section 215 of the Federal Power Act requires FERC to designate an Electric Reliability Organization (ERO) to develop, with industry, standards to ensure reliable operation of the grid, which it proposes to the Commission for approval. NERC is the Commission-certified ERO. After review and approval by the Commission, compliance with the reliability standards is mandatory by users, owners and operators of the grid in the United States. NERC and its seven Regional Entities enforce the standards and may impose penalties for noncompliance, after notice and opportunity for hearing, subject to review and approval by the Commission. The Commission may also enforce reliability standards independently of NERC.

Importantly, the ERO is responsible for developing and proposing new or modified reliability standards to the Commission. The Commission may approve new or modified reliability standards if it finds them to be "just, reasonable, not unduly discriminatory or preferential, and in the public interest." If a proposed standard does not meet this test, then the Commission may remand it to the ERO for revision. The Commission may not write or modify a reliability standard. If the Commission determines that there is a need for a new or modified standard, it may, on its own motion or upon complaint, direct the ERO to develop and submit a standard to meet the identified reliability need.

## Blackstart is the Process of Restarting the Grid after a Blackout

When there is a widespread outage, and offsite power is not available, resources that are capable of starting without a connection to the grid are called on to start the process of restoring the grid. These resources are called “blackstart” resources.<sup>1</sup>

The Emergency Preparedness and Operations, or EOP, reliability standards, seek to ensure that utilities appropriately prepare for extreme events, and blackstart resources and planning are covered in reliability standard EOP-005-2 (System Restoration from Blackstart Resources). The purpose of that standard is to:

Ensure plans, Facilities, and personnel are prepared to enable System restoration from Blackstart Resources to assure reliability is maintained during restoration and priority is placed on restoring the Interconnection.<sup>2</sup>

Reliability Standard EOP-005-2 contains eighteen requirements to ensure adequate planning, coordination and testing of blackstart. Among others, the standard requires responsible entities: to have a system restoration plan, which includes identifying specific blackstart units; to verify the effectiveness of the restoration plan, through testing, simulation, and analysis of actual events; to keep the restoration plan up-to-date; and to ensure up-to-date system restoration training for operating personnel.

Blackstart capability is important because widespread outages or blackouts can occur resulting in the unavailability of off-site power from the grid. Restoration begins with blackstart units starting. These units energize a particular set of transmission lines and serve certain loads, with the goal of providing offsite power to larger generating units that can serve more load. The series of lines that are energized as part of a blackstart plan are called “cranking paths.”

Blackstart units are typically small diesel generators or gas fired generating units which can be started without power from the grid. Larger hydroelectric units can also be used for blackstart because they require very little initial power to start, and can provide a large amount of power quickly. Staff’s recent review of entities’ blackstart plans showed that a utility in Southern California successfully demonstrated the use of a battery energy storage system to provide blackstart service. In addition to these blackstart units identified in entities’ blackstart plans, entities also have access to other blackstart-capable units.

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<sup>1</sup> NERC defines a blackstart resource as a “generating unit(s) and its associated set of equipment which has the ability to be started without support from the Bulk Electric System or is designed to remain energized without connection to the remainder of the System, with the ability to energize a bus, meeting the Transmission Operator’s restoration plan needs for Real and Reactive Power capability, frequency and voltage control, and that has been included in the Transmission Operator’s restoration plan.” *See* NERC Glossary of Terms, [https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary\\_of\\_Terms.pdf](https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf).

<sup>2</sup> [https://www.nerc.com/\\_layouts/15/PrintStandard.aspx?standardnumber=EOP-005-2&title=System%20Restoration%20from%20Blackstart%20Resources&jurisdiction=United%20States](https://www.nerc.com/_layouts/15/PrintStandard.aspx?standardnumber=EOP-005-2&title=System%20Restoration%20from%20Blackstart%20Resources&jurisdiction=United%20States)

## The FERC-NERC-Regional Entity Review of Blackstart Resource Availability and Testing

Beginning in September 2014, Commission staff has been collaborating with NERC, Regional Entities, utilities and grid operators on a series of studies and reports regarding restoring the grid after a widespread blackout. The motivation for the initial study was to get a comprehensive understanding of the electric utility industry's bulk-power system recovery and restoration planning, focusing specifically on the reliability standards relevant to system recovery and restoration, which require entities to develop and test plans for recovery and restoration. To do this, Commission staff worked collaboratively with staff from NERC and the Regional Entities to review the plans for recovery and restoration of utilities of participating utilities. Utilities participated voluntarily in the joint reviews, which identified and documented best practices, and were not compliance audits or enforcement investigations. Since the release of the initial study in January 2016, the joint study team has released two additional studies. The latest study, focused on blackstart, is the main topic of this hearing.

In May 2018, staff released the *FERC-NERC-Regional Entity Joint Review of Blackstart Resources Availability (BRAv)*. This study took a close look at: “(1) the availability of blackstart resources, including the identification of strategies for replacing these resources going forward and the factors to be considered for such replacement resources; and (2) options for expanding system restoration plan testing beyond the currently required blackstart resource testing, to ensure that a blackstart resource can energize equipment necessary to restore the system as intended in the restoration plan.”<sup>3</sup> The study also included an assessment of registered entities' blackstart resource testing under anticipated blackstart conditions to ensure that these resources can effectively restore the bulk-power system following a widespread outage.

The joint team is grateful for the participation of nine anonymous utilities for their participation in the study. Staff considered the following factors when identifying participants: those with significant grid operational responsibilities; utilities in different regions so as to document regional differences; those that have or are experiencing changes in their blackstart resources; those that have conducted expanded testing of blackstart; those that have experience with large-scale system restoration.

Based on staff's observations of the participating utilities, the overwhelming majority of blackstart units are gas turbines, diesel generators, and pumped and traditional hydroelectric facilities. During staff's recent review of entities' blackstart plans, several participants indicated that the total number of available blackstart-capable units in their respective footprints has decreased over time due to the impact of regulations and the retirement of non-economic or aging assets.

The study concluded that although some participants have experienced a decrease in the availability of blackstart resources due to retirement of blackstart-capable units over the past decade, the participants have verified they currently have sufficient blackstart resources in their system restoration plans, as well as comprehensive strategies for mitigating against loss of any

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<sup>3</sup> *FERC-NERC-Regional Entity Joint Review of Restoration and Recovery Plans: Blackstart Resource Availability*, at 1.

additional blackstart resources going forward. The study also found that participants that have performed expanded testing of blackstart capability, including testing energization of the next-start generating unit, gained valuable knowledge that was used to modify, update and improve their system restoration plans. Participants also used the knowledge gained to update and improve their existing steady state and dynamic models of those plans, as well as their system restoration drills.

The study recommended that utilities perform expanded testing of blackstart cranking paths where feasible. Doing this requires a utility to take advantage of maintenance outages and other events to test certain aspects of the restoration plan so that real-world experiences can supplement the computer simulations that assist in developing such plans. Additionally, the study recommended that utilities assess whether they rely on a single fuel for blackstart and mitigate their reliance on it if feasible. Further the report recommended that utilities verify the accuracy of simulations of their blackstart plans to ensure these plans would work during actual system restoration. For those utilities that reported a decline in the number of available blackstart units, the entities reviewed have verified that they have sufficient blackstart resources to support their current restoration plans. The study recommended that, if relevant, the utility examine the adequacy of their compensation for blackstart services, potentially including next-start generators and participation in expanded testing.

Ensuring reliable operations of the grid relies on real-time monitoring and control of thousands of transmission system components scattered across a wide area. To support these operations, utilities rely on both proprietary and contracted communications systems, supervisory control and data acquisition (SCADA) systems, and energy management systems (EMS). Utilities have made significant investments in these systems and seek for them to be as redundant and available as possible.

In the event of a widespread blackout, however, there is a concern that the sensors and computer systems that utilities use to operate the grid would be unavailable to support restoration. Substations include backup battery power to support these systems for a short time, but they could become depleted and unable to support restoration. To investigate whether utilities were adequately prepared for such a situation, Commission staff, along with NERC and the Regional Entities conducted a joint study that evaluated the ability of utilities to restore the grid in the absence of remote grid measurements, communications, and software support systems. Similar to the study regarding blackstart discussed earlier, the joint study team worked with eight volunteer utilities to evaluate their ability to carry out their restoration plans in the absence of EMS or SCADA.

The joint study on Planning and Restoration absent EMS or SCADA (PRASE) showed that without these systems the study participants would remain capable of executing their restoration plans. Some of the participants specifically planned for system restoration without EMS or SCADA. Other participants emphasized emergency preparedness for challenging restoration conditions without specifically planning for the loss of EMS or SCADA. The participants acknowledged, however, that complete restoration would be more time consuming and labor intensive without their computer support systems. In particular, the steps of the restoration

process that require wider coordination, and those steps performed during later stages of the restoration process, include load pick up, managing voltage and frequency, and synchronization with other islands or systems. To restore the grid without access to EMS and SCADA, the joint study team found that participants would use support engineers to aid the transmission system operators in the analyses needed for system restoration. For example, additional operations engineering support and power system modeling staff using offline power flow tools would simulate restoration steps to assist operators in their decision-making process. Additionally, the restoration team would manually record the status of the grid during the restoration process. Manual restoration of the grid would require utilities to deploy personnel to the field, and would require robust backup communications systems.

The joint study team recommended that utilities prepare for this situation by assessing the availability of backup power, the adequacy communications, and personnel requirements. Further, the joint study team recommended that utilities include restoration without EMS or SCADA in their restoration exercises.

I thank the Committee for the opportunity to participate in this hearing and look forward to answering your questions.