

2. For each location identified above, how often and when were backup power supplies tested, including testing of switchover (i.e., from primary power supply to backup power supply), during 2016? What are the procedures for testing, and how are the tests documented?

Consistent with the Commission's request, NERC collected data from a representative sample of nine entities registered with NERC as a BA, RC, and/or TOP regarding their current practices for backup power supplies at Control Centers and other critical locations. As discussed below, each of the entities surveyed had backup power supplies at their primary and backup Control Centers and, in some cases, other locations such as data centers, power plants, and other types of operations centers. The surveyed entities indicated they use backup generators and batteries to provide power to these locations when their normal power supply is lost. The overwhelming majority of surveyed entities indicated they perform run testing of their backup power supplies on a monthly basis. In some cases, the entities also performs switchover (or transfer) testing on a monthly basis while others perform such testing at longer intervals (e.g., annually).

This response is organized as follows: Section 1 discusses the representative sample of registered entities selected to share information; Section 2 discusses the responses to the Commission's first question regarding location and type of backup power supplies; and Section 3 discusses the responses to the Commission's second question regarding testing of backup power supplies.

1. Representative Sample of Registered Entities

As noted above, NERC collected data from nine entities registered as BAs, RCs, and/or TOPs. Of the nine entities, two are registered as a BA, RC, and TOP; five are registered as both a BA and TOP; one is registered as a TOP but neither a BA nor RC; and one is registered as a BA but neither a RC nor TOP. Further, to get a representative sample of entities, NERC collected data from at least one entity in each Regional Entity footprint. The sample of entities also reflects a

combination of Independent System Operators/Regional Transmission Organizations, investor-owned utilities, and electric cooperatives. Given the diversity of surveyed entities, the information provided herein should be representative of current practices throughout the industry. As discussed below, each of the surveyed entities have sufficient backup power supplies and test these supplies on a regular basis in accordance with their internal policies.

2. Location and Types of Backup Power Supplies

a. Location

As noted above, each of the surveyed entities reported that they have backup power supplies at both their primary and backup Control Centers. The entities reported that backup power supplies at these locations was a matter of sound operating practices to ensure continued operations in the event their main sources of power are lost. A number of entities reported that backup power supplies at their primary and backup Control Centers were installed prior to the effective date of NERC's mandatory Reliability Standards and, because of the importance of having backup power at Control Centers, would not change their practices if the Commission approves the elimination of Requirement R15 of BAL-005-0.2b.

Entities reported that their decisions as to where to locate backup power supplies were based on determination as to where such supplies were most critical for continued operations. Based on such determinations, in addition to their Control Centers, surveyed entities also identified other facilities for which backup supplies are used, as follows:

- One of the entities reported that it had backup power supplies for its data center, which was not located in the same buildings as its primary or backup Control Centers.
- Two of the surveyed entities reported that they also had backup power supplies to service certain corporate facilities. One of those entities explained that certain corporate facilities were chosen for backup power supply, in part, to provide senior management the ability to address emergency situations.

- Another entity reported providing backup power supplies to its operations center that houses its cyber and physical security operations.
- Lastly, one of the surveyed cooperatives reported that it has backup power supplies at its primary base load generation facility and a peaking plant.

b. Type

The surveyed entities identified two types of backup power supply sources at their primary and backup Control Centers: (1) backup generators; and (2) uninterruptible power supply (“UPS”) batteries. Additionally, two entities noted that they have power feeds from separate utility providers to create redundancies in their main sources of power. As the data request focused on backup power supplies, other entities may have power feeds from separate utilities but did not report it to NERC as part of the data request. Attachment 1 hereto provides details on the backup power supplies, including the length of time these sources provide power. As provided in Attachment 1, the surveyed entities reported adequate levels of backup power supplies to provide for continued operations in the event they lose their normal source of power.

3. Testing of Backup Power Supplies

Each of the surveyed entities reported that they regularly test their backup power supplies in accordance with written procedures. The overwhelming majority of surveyed entities indicated they perform run testing of their backup power supplies on a monthly basis. In some cases, entities also perform switchover (or transfer) testing on a monthly basis while others perform such testing at longer intervals (e.g., annually). Each of the entities confirmed that they performed run and/or switchover testing in 2016 in accordance with their written procedures. Attachment 2 hereto provides additional detail on the testing practices of the surveyed entities.

4. Conclusion

NERC respectfully requests that the Commission consider this additional information and approve proposed Reliability Standards BAL-005-1 and FAC-001-3 and the retirement of currently-effective Reliability Standards BAL-005-0.2b, BAL-006-2, and FAC-001-2.

Respectfully submitted,

/s/ Shamai Elstein

Shamai Elstein

Senior Counsel

North American Electric Reliability Corporation

1325 G Street, N.W., Suite 600

Washington, D.C. 20005

(202) 400-3000

shamai.elstein@nerc.net

Counsel for the North American Electric Reliability Corporation

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Attachment 1

Attachment 1

The following chart provides details on the backup power supplies reported by each surveyed entity, including the length of time these sources provide power.

Entity Functions	Primary Control Center	Backup Control Center	Other Locations
Respondent 1 - BA - TOP	One backup generator (2 MW) - 65 hours of supply - Generator serves entire building (primary Control Center, distribution operations, corporate incident command center...etc.), Also equipped with a UPS system to support critical load while the generator starts and comes on line.	One backup generator (2 MW) - 74 hours of supply - Generator serves only critical loads in building (excludes non-essential workstations, conference rooms, corridor outlets, and non-essential lighting) Also equipped with a UPS system to support critical load while the generator starts and comes on line.	Data Center and Integrated Operations Center (cyber and physical security operations): - One generator (1.25 MW) - 58 hours of supply - Serves entire building
Respondent 2 - BA - TOP	One diesel Generator - 100 hours of supply before refueling - Provides backup power to server room and dispatch, HVAC serving critical areas, and lighting in critical areas Battery (UPS) - Two 100 kVA batteries Rated to provide power at full load for one hour and currently running at 25% overall capacity - Designed to keep EMS workstations and critical corporate workstations running Respondent 2 has multiple power feeds from different utilities	One diesel generator - 40 hours of supply before refueled - Serves critical load Battery (UPS) - One 80 kVA batter - Rated to provide power at full load for a one hour and is currently running at 30% overall capacity - Designed to keep all Control Center infrastructure running	- Some corporate facilities (e.g., boardroom) have backup power to facilitate upper management meetings to address emergency situations

Entity Functions	Primary Control Center	Backup Control Center	Other Locations
Respondent 3 - BA - TOP	Generators <ul style="list-style-type: none"> - Two 2,100 kW diesel generators (4,200 kW total) - Respondent 3 reported enough fuel on site for 72 hours and has access to delivery of additional fuel to run continuously. - Supplies critical facilities (control rooms, data centers, and network rooms) Battery <ul style="list-style-type: none"> - Two trains of two 675 kW UPS modules (total capacity of 2700 kW) 	Generators <ul style="list-style-type: none"> - One 1000 kW diesel generator - Respondent 3 reported enough fuel on site for 72 hours and has access to delivery of additional fuel to run continuously. Battery <ul style="list-style-type: none"> - 320 kW UPS module 	n/a
Respondent 4 - BA - RC - TOP	Generators <ul style="list-style-type: none"> - 50 hours of service - Respondent 4 reported they have emergency fuel contract in place to service generators Battery (UPS) <ul style="list-style-type: none"> - UPS battery could supply power for 25 minutes under full load 	Generators <ul style="list-style-type: none"> - 50 hours of service - Respondent 4 reported they have emergency fuel contract in place to service generators Battery (UPS) <ul style="list-style-type: none"> - UPS battery could supply power for 25 minutes under full load 	n/a
Respondent 5 - BA - TOP	Generator <ul style="list-style-type: none"> - 400 kW diesel generator - Services entire Control Center building - Fuel tank supplies power for 15-16 hours and Respondent 5 has resupply contract with local delivery sources to supply fuel indefinitely 	Generator <ul style="list-style-type: none"> - 29.6 MW – fuel oil - Serves entire Control Center building - Full tank supplies approximately 17 hours with resupply services in place with local delivery to supply fuel indefinitely 	Respondent 5 also has backup generators at its corporate headquarters (24 hours of support before resupply), its primary base load power plant (48 hours of support before resupply), and a peaking Plant (23 hours of support before resupply)

Entity Functions	Primary Control Center	Backup Control Center	Other Locations
<p>Respondent 6</p> <ul style="list-style-type: none"> - BA - RC - TOP 	<p>Three generators</p> <ul style="list-style-type: none"> - Two 1500 kV generators for critical load (control room, data centers, etc.) - One 750 kV for non-critical elements (building lights, etc.) <p>Battery</p> <ul style="list-style-type: none"> - two 750 kVA UPS modules - Provide redundant conditioned power <p>Respondent 6 reported that it has multiple power feeds from separate utility providers</p> <p>Reported a total of five days of backup power</p>	<p>Three generators</p> <ul style="list-style-type: none"> - Two 1500 kV generators for critical load (control room, data centers, etc.) - One 600 kV generator for non-critical elements (building lights, etc.) <p>Battery</p> <ul style="list-style-type: none"> - two 750 kVA UPS modules - Provide redundant conditioned power <p>Respondent 6 reported that it has multiple power feeds from separate utility providers</p> <p>Reported a total of five days of backup power</p>	<p>n/a</p>
<p>Respondent 7</p> <ul style="list-style-type: none"> - TOP 	<p>Generator</p> <ul style="list-style-type: none"> - Supplies backup power indefinitely with adequate fuel supply - Serves critical load <p>Battery</p> <ul style="list-style-type: none"> - UPS module - Supplies power for 22 minutes - In place to supply power until generators start 	<p>Generator</p> <ul style="list-style-type: none"> - Supplies backup power indefinitely with adequate fuel supply - Serves critical load <p>Battery</p> <ul style="list-style-type: none"> - UPS module - Supplies power for 20 minutes - In place to supply power until generators start 	<p>n/a</p>

Entity Functions	Primary Control Center	Backup Control Center	Other Locations
Respondent 8 - BA - TOP	Generator <ul style="list-style-type: none"> - Service entire facility where Control Center is located - Dual back-up generators for redundancy - Approximately 20 days of fuel on site Battery (UPS) <ul style="list-style-type: none"> - In place for all critical loads - Designed to provide 2 hours of supply until backup generators start running 	Generator <ul style="list-style-type: none"> - Service entire facility where Control Center is located - Dual back-up generators for redundancy - Approximately 20 days of fuel on site Battery (UPS) <ul style="list-style-type: none"> - In place for all critical loads - Designed to provide 2 hours of supply until backup generators start running 	n/a
Respondent 9 - BA	Generator <ul style="list-style-type: none"> - Diesel unit with 1750 kW capacity - 22 hours of supply on one tank with additional fuel supply close by - Serves entire Control Center building Battery <ul style="list-style-type: none"> - 2 400 kVA UPS devices - Supplies power for 8-10 minutes at full load - Serves entire Control Center building 	Generator <ul style="list-style-type: none"> - Diesel unit with 500 kW capacity - 24 hours of supply on one tank with additional fuel supply close by - Serves entire Control Center building Battery <ul style="list-style-type: none"> - 120 kVA UPS devices - Supplies power for 8-10 minutes at full load - Serves entire Control Center building 	n/a

Attachment 2

Attachment 2

The following chart provides details on the testing of backup power supplies.

Entity	Testing Type and Timeframe	Procedures and Documentation
Respondent 1 - BA - TOP	Performs monthly run testing of back power supply for all locations with backup power supply, including two hour load bank testing (at 100% for one hour and 80% for one hour). Performs annual switchover testing for all locations with backup power supply to simulate a loss of utility power to allow automatic operation of generator, UPS and HVAC systems.	Testing performed according to written procedures. Testing is documented in a Method of Procedure document and the test report summarizing the test results.
Respondent 2 - BA - TOP	Performs monthly run testing of its backup generators and UPS batteries at all locations. Backup power supply run with all load for an hour. Performs annual switchover testing for generators and batteries at all locations with backup power supply. For batteries, a vendor provides maintenance on an annual basis. Batteries manufacturer performs maintenance twice a year.	Testing performed according to written procedures. Testing is documented in logs.
Respondent 3 - BA - TOP	For its generators, performs run testing and preventative maintenance at all locations on a quarterly basis; changes oil and filter on an annual basis, and performs a full load bank test annually. For battery backup, performs quarterly maintenance tests and inspections. Performs switchover testing of generators and batteries at all locations at least once every three years.	Testing performed according to written procedures. Testing documented through change management process and test results are captured in trend logs on the building automation system that monitors backup power supplies.
Respondent 4 - BA - RC - TOP	Performs run testing every two weeks for 30 minutes. Performed switchover testing on a monthly basis.	Testing performed according to written procedures. Testing is documented in SCADA system event log as well as through a computerized maintenance management system.

Entity	Testing Type and Timeframe	Procedures and Documentation
Respondent 5 - BA - TOP	<p>Performs run testing for the backup generators at its primary Control Center and corporate headquarters for one hour on a monthly basis.</p> <p>Performs run testing for the backup generator at its backup Control Center every other month.</p> <p>Performs switchover testing at its primary Control Center and corporate headquarters on a monthly basis but at its backup Control Center every three years.</p>	<p>Testing performed according to written procedures.</p> <p>Testing documented on Operational Record and Emergency Generator Check Sheet</p>
Respondent 6 - BA - RC - TOP	<p>Perform run testing (30 minute load test) on a monthly basis.</p> <p>Performs switchover testing on a monthly basis.</p>	<p>Testing performed according to written procedures.</p> <p>Testing documented through log sheets in Work Order Maintenance System</p>
Respondent 7 - TOP	<p>Performs testing of the UPS batteries on a semi-annual basis and the backup generators on a monthly basis.</p> <p>There are three levels of inspection/testing for the generators, one of which includes an actual transfer or switchover.</p>	<p>All tests are conducted by contractors and the results documented on an Inspection and/or Test Report. Records are reviewed and retained on-site.</p>
Respondent 8 - BA - TOP	<p>Performs testing of backup power supplies at each location at least every month. The test procedures include switchover and a test of each configuration.</p>	<p>Testing performed according to written procedures.</p> <p>Testing documented in a work management system.</p>
Respondent 9 - BA	<p>Performs (one hour) run testing for backup generators at all locations on a monthly basis. Performs run testing for UPS battery annual basis with switchover test.</p> <p>Performs annual switchover testing at all locations.</p> <p>Performs annual full load testing for generators at all locations.</p>	<p>Testing performed according to written procedures.</p> <p>Testing documentation stored on in database and with copies from vendors.</p>