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U.S. Nuclear Regulatory Commission
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Braidwood Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Application to Revise Technical Specifications 3.8.1, "AC Sources-Operating"

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Exelon Generation Company, LLC (EGC) is submitting a request for amendments to the Technical Specifications (TS) for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2. The proposed amendments would modify TS 3.8.1, "AC Sources-Operating," to revise certain minimum and maximum voltage and frequency acceptance criteria for steady-state standby diesel generator surveillance testing.

The license amendment request (LAR) is required to correct a non-conservative TS. Plant operations are currently administratively controlled as described in NRC Administrative Letter (AL) 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety." In accordance with the guidance in AL 98-10, this LAR is required to resolve non-conservative TS and is not a voluntary request to change the Braidwood and Byron Stations' licensing basis. Therefore, this request is not subject to "forward fit" considerations as described in a letter from S. G. Burns (NRC, General Counsel) to E. C. Ginsberg (NEI), dated July 14, 2010 (ADAMS Accession No. ML101960180).

The proposed changes have been reviewed by the Braidwood Station and Byron Station Plant Operations Review Committees in accordance with the requirements of the EGC Quality Assurance Program.

Attachment 1 provides a description of the proposed change, the requested confirmation of applicability, assessment, regulatory analysis, and environmental consideration of the proposed changes. Attachments 2 and 3 provide the existing TS pages for Braidwood and Byron Stations, respectively, marked up to show the proposed changes. Attachments 4 and 5 provide the existing TS Bases pages for Braidwood and Byron Stations, marked up to show the proposed changes (for information only).

EGC requests approval of the proposed amendments by June 28, 2021. Upon issuance, the amendments shall be implemented within 90 days.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), EGC is notifying the State of Illinois of this application for license amendment by transmitting a copy of this letter and its attachments to the designated State Official.

There are no commitments in this submittal. Should you have any questions concerning this letter, please contact Ms. Lisa A. Simpson at (630) 657-2815.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 26th day of June 2020.

Respectfully,

Dwi Murray
Sr. Manager – Licensing
Exelon Generation Company, LLC

Attachments:
1) Description and Assessment
2) Proposed Technical Specifications Changes for Braidwood Station, Units 1 and 2
3) Proposed Technical Specifications Changes for Byron Station, Units 1 and 2
4) Proposed Technical Specifications Bases Changes for Braidwood Station, Units 1 and 2
5) Proposed Technical Specifications Bases Changes for Byron Station, Units 1 and 2

cc: NRC Regional Administrator – Region III
NRC Senior Resident Inspector – Braidwood Station
NRC Senior Resident Inspector – Byron Station
NRC Project Manager, NRR – Braidwood and Byron Stations
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 1
Description and Assessment

Subject: Application to Revise Technical Specifications 3.8.1, "AC Sources-Operating"

ATTACHMENT 1
Description and Assessment

1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Renewed Facility Operating Licenses NPF-72 and NPF-77 for Braidwood Station, Unit 1 and Unit 2, and Renewed Facility Operating Licenses NPF-37 and NPF-66 for Byron Station, Unit 1 and Unit 2. The proposed changes would revise the Renewed Facility Operating Licenses to modify Technical Specifications (TS) 3.8.1, "AC Sources-Operating," to revise certain minimum and maximum voltage and frequency acceptance criteria for steady-state standby diesel generator (DG) surveillance testing.

The license amendment request (LAR) is required to correct a non-conservative TS. Plant operations are currently administratively controlled as described in NRC Administrative Letter (AL) 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety." In accordance with the guidance in AL 98-10, this LAR is required to resolve non-conservative TS and is not a voluntary request to change the Braidwood Station and Byron Stations' licensing basis. Therefore, this request is not subject to "forward fit" considerations as described in a letter from S. G. Burns (NRC, General Counsel) to E. C. Ginsberg (NEI), dated July 14, 2010 (ADAMS Accession No. ML101960180).

2.0 DETAILED DESCRIPTION

2.1 System Design and Operation

As described in the Braidwood/Byron UFSAR Section 8.3.1.1.2.2, the onsite (emergency) AC power system for each unit consists of two DGs, one for each Engineered Safety Features (ESF) division. The DGs provide an independent emergency source of power in the event of a complete loss of offsite power (LOOP). The DG supplies all of the electrical loads, which are required for reactor safe shutdown either with or without a loss-of-coolant accident (LOCA). The DG is designed to attain rated voltage and frequency and be ready to accept load 10 seconds after the receipt of an automatic start signal.

Each DG unit consists of a diesel engine, an electrical generator and fuel oil, lubricating oil, combustion air, cooling water and Diesel Generator Room Ventilation support systems, which must all be functional when an DG start signal is received. The electrical output of the DGs is fed to the 4.16 kV buses that distribute power for the operation of essential safe shutdown equipment. The diesel generators have been sized as described in UFSAR Section 8.1.2 to meet the maximum expected horsepower requirements during a design-bases accident. Each ESF division is also served by a separate 125-VDC battery source to provide power to Safety-Related DC loads and control circuits.

The Safety-Related function of the DGs is to provide an emergency source of power in the event that offsite power is not available to supply all the electrical loads required for safe shutdown of the reactor either with or without a LOCA. A 4.16 kV ESF bus undervoltage or Safety Injection (SI) signal will start the DGs, which will attain rated frequency and voltage within ten seconds and energize the ESF buses for a LOOP with or without a LOCA. If a LOCA were to occur without a LOOP, the ESF buses would remain energized by the offsite power source, and the DGs would run unloaded.

2.2 Reason for the Proposed Change

As documented in NRC Inspection Report 2011-009 dated July 22, 2011, documenting the NRC Evaluation of Changes, Tests, or Experiments and Permanent Plant Modifications Baseline Inspection at Byron Station (Reference 1), the NRC identified a finding of very low safety significance and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, Design Control, for the failure to correctly translate applicable design basis (calculations) into specifications. Specifically, Byron Station failed to consider fuel oil consumption at an increased frequency of 61.2 Hz in their DG loading calculations, which resulted in non-conservative TS.

After the non-conservative TS surveillance acceptance criteria for DG steady-state frequency was discovered, the procedures containing the applicable surveillance acceptance criteria were revised to protect the assumptions in the licensing and design basis. Corresponding changes to steady-state voltage acceptance criteria were also made. The issue is being tracked in the EGC corrective action program. As a final corrective action, EGC is pursuing this LAR to ensure that the design basis is protected.

To address the generic concern, Westinghouse developed WCAP-17308-NP-A, Revision 0 (Reference 2). EGC used WCAP-17308-NP-A, in conjunction with the NRC's Safety Evaluation (Reference 3), to conduct the calculations that support the enclosed technical evaluation.

2.3 Description of the Proposed Change

TS 3.8.1 currently requires the DGs to maintain a steady state frequency from 58.8 Hz to 61.2 Hz (±2%). TS 3.8.1 is being revised to reduce the tolerance for DG frequency during steady-state operation to ±0.5 Hz (i.e., 59.5 Hz to 60.5 Hz, or ±0.83%).

TS 3.8.1 is also being revised to reduce the DG voltage setpoint tolerance during steady-state operation from 3950 V to 4580 V (+10/-5%) to ±210 V (i.e., 3950 V to 4370 V, or ±5%).

The following proposed changes to SRs within TS 3.8.1 are being requested (changed text **underlined and bolded**):

Current SR 3.8.1.2:

----------NOTE:----------
A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. Performance of SR 3.8.1.7 satisfies this SR.

Verify each DG starts from standby condition and achieves steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Revised SR 3.8.1.2:

----------NOTE:----------
A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. Performance of SR 3.8.1.7 satisfies this SR.

Verify each DG starts from standby condition and achieves steady state voltage ≥ 3950 V and ≤ **4370** V and frequency ≥ **59.5** Hz and ≤ **60.5** Hz.

Current SR 3.8.1.7:

Verify each DG starts from normal standby condition and achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz;

b. Steady state voltage ≥ 3950 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Revised SR 3.8.1.7:

Verify each DG starts from normal standby condition and achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz;

b. Steady state voltage ≥ 3950 V and ≤ **4370** V, and frequency ≥ **59.5** Hz and ≤ **60.5** Hz.

Current SR 3.8.1.9:

----------NOTE:----------
This Surveillance shall not be performed in MODE 1 or 2.

Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and:

a. Following load rejection, the frequency is ≤ 64.5 Hz;

b. Following load rejection, the steady state voltage is maintained ≥ 3950 V and ≤ 4580 V; and

c. Following load rejection, the steady state frequency is maintained ≥ 58.8 Hz and ≤ 61.2 Hz.

Revised SR 3.8.1.9:

----------NOTE:----------
This Surveillance shall not be performed in MODE 1 or 2.

Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and:

a. Following load rejection, the frequency is ≤ 64.5 Hz;

b. Following load rejection, the steady state voltage is maintained ≥ 3950 V and ≤ **4370** V; and

c. Following load rejection, the steady state frequency is maintained ≥ **59.5** Hz and ≤ **60.5** Hz.

Current SR 3.8.1.11:

----------NOTE:----------
This Surveillance shall not be performed in MODE 1, 2, 3, or 4.

Verify on an actual or simulated loss of offsite power signal:

a. De-energization of ESF buses;

b. Load shedding from ESF buses; and

c. DG auto-starts from standby condition and:

1. energizes permanently connected loads in ≤ 10 seconds,

2. energizes auto-connected shutdown loads through the shutdown load sequence timers,

3. maintains steady state voltage ≥ 3950 V and ≤ 4580 V,

4. maintains steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and

5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.

Revised SR 3.8.1.11:

----------NOTE:----------
This Surveillance shall not be performed in MODE 1, 2, 3, or 4.

Verify on an actual or simulated loss of offsite power signal:

a. De-energization of ESF buses;

b. Load shedding from ESF buses; and

c. DG auto-starts from standby condition and:

1. energizes permanently connected loads in ≤ 10 seconds,

2. energizes auto-connected shutdown loads through the shutdown load sequence timers,

3. maintains steady state voltage ≥ 3950 V and ≤ **4370** V,

4. maintains steady state frequency ≥ **59.5** Hz and ≤ **60.5** Hz, and

5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.

Current SR 3.8.1.12: Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz;

b. Achieves steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz; and

c. Operates for ≥ 5 minutes.

Revised SR 3.8.1.12: Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz;

b. Achieves steady state voltage ≥ 3950 V and ≤ **4370** V and frequency ≥ **59.5** Hz and ≤ **60.5** Hz; and

c. Operates for ≥ 5 minutes.

Current SR 3.8.1.15:

----------NOTE:----------

1) This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 4950 kW and ≤ 5500 kW or until operating temperature has stabilized.

2) Momentary transients outside of load range do not invalidate this test.

Verify each DG starts and achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and

b. Steady state voltage ≥ 3950 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Revised SR 3.8.1.15:

----------NOTE:----------

1) This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 4950 kW and ≤ 5500 kW or until operating temperature has stabilized.

2) Momentary transients outside of load range do not invalidate this test.

Verify each DG starts and achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and

b. Steady state voltage ≥ 3950 V and ≤ **4370** V, and frequency ≥ **59.5** Hz and ≤ **60.5** Hz.

Current SR 3.8.1.19:

----------NOTE:----------

This Surveillance shall not be performed in MODE 1, 2, 3, or 4.

Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal:

a. De-energization of ESF buses;

b. Load shedding from ESF buses; and

c. DG auto-starts from standby condition and:

   1. energizes permanently connected loads in ≤ 10 seconds,

2. energizes auto-connected emergency loads through the safeguards sequence timers,

3. achieves steady state voltage ≥ 3950 V and ≤ 4580 V,

4. achieves steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and

5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.

Revised SR 3.8.1.19:

----------NOTE:----------
This Surveillance shall not be performed in MODE 1, 2, 3, or 4.

Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal:

a. De-energization of ESF buses;

b. Load shedding from ESF buses; and

c. DG auto-starts from standby condition and:

1. energizes permanently connected loads in ≤ 10 seconds,

2. energizes auto-connected emergency loads through the safeguards sequence timers,

3. achieves steady state voltage ≥ 3950 V and ≤ **4370** V,

4. achieves steady state frequency ≥ **59.5** Hz and ≤ **60.5** Hz, and

5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.

Current SR 3.8.1.20: Verify when started simultaneously from standby condition, each DG achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and

b. Steady state voltage ≥ 3950 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Revised SR 3.8.1.20: Verify when started simultaneously from standby condition, each DG achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and

b. Steady state voltage ≥ 3950 V and ≤ **4370** V, and frequency ≥ **59.5** Hz and ≤ **60.5** Hz.

These proposed changes are consistent with the marked-up NUREG-1431 Surveillance Requirements provided in WCAP-17308-NP-A.

Attachments 2 and 3 provide the existing TS pages for Braidwood Station and Byron Station, respectively, marked up to show the proposed changes. To assist in the NRC's review of the LAR, Attachments 4 and 5 provide the proposed changes to the TS Bases pages for Braidwood Station and Byron Station for information only.

3.0 TECHNICAL EVALUATION

The Braidwood Station and Byron Station current plant safety analyses make specific assumptions regarding the operation of the Safety-Related pumps, Motor Operated Valves (MOVs), fans/blowers, and other miscellaneous non-rotating equipment. For the events that assume offsite power is lost (with or without a design basis accident), the DGs provide power to these components for safe shutdown and/or accident mitigation. The analyses assume that the steady-state frequency is 60 Hz and the steady-state voltage is 4160 V after the DG starting and loading transients. The performance of the pumps, MOVs, and fans/blowers is dependent on the DG frequency and voltage.

To evaluate the acceptability of the proposed change, EGC evaluated the proposed change in accordance with WCAP-17308-NP-A. Specifically, the following items were evaluated for changes in steady-state voltage and frequency:

- Impact on Safety-Related Functions and other Non-Safety-Related Functions
- Impact on DG Loading
- Impact on DG Fuel Oil Consumption Calculations
- Impact on MOV Performance

The performance requirements of the driven pumps, fans/blowers, MOVs, and other equipment are not being changed; therefore, their impact is not being evaluated in this LAR.

The TS for Braidwood Station and Byron Station contain Surveillance Requirements within TS 3.8.1, "AC Sources-Operating," that place limits on the DG frequency and voltage ranges under steady-state conditions. These tolerances, however, were derived from DG starting and loading transient criteria from Regulatory Guide (RG) 1.9, Revision 3. Since the wording of the TS Surveillance Requirements would allow steady-state DG operation within those limits, the NRC has challenged licensees as to whether the impacts of the allowable tolerances in steady-state DG frequency and voltage have been evaluated with respect to the performance of the affected equipment and existing analyses. In response to this challenge, an administrative limit for DG steady-state frequency was established.

3.1 Impact on Safety-Related and other Non-Safety-Related Functions

Following a LOCA, the Emergency Core Cooling System (ECCS) is initiated to provide cooling water to the Reactor Coolant System (RCS), and the Containment Spray (CS) system is initiated to provide cooling water to the containment atmosphere through the containment spray nozzles. The ECCS consists of two high-head pumps (these pumps are referred to as the CV pumps as they are part of the Chemical and Volume Control System), two intermediate-head SI pumps, and two low-head Residual Heat Removal (RH) pumps. The ECCS also includes the Safety Injection Accumulators. Flow from the accumulators is not addressed in this analysis.

WCAP-17308-NP-A provides the methodology for evaluating equipment performance within the calculated tolerances for DG voltage and frequency. This WCAP also includes the methodology for establishing new inservice test (IST) acceptance criteria for the applicable pumps that are energized by a DG. Revisions to existing hydraulic calculations for the ECCS, CS, and Auxiliary Feedwater (AFW) systems were made to support the development of revised IST acceptance criteria.

The purpose of the ECCS is to remove the stored and fission product decay heat from the reactor core during accident conditions. ECCS equipment and components include the Centrifugal Charging pumps 1(2)CV01PA/B, SI pumps 1(2)SI01PA/B, RHR pumps 1(2)RH01PA/B and associated valves/components.

The purpose of the CS system is to remove fission products, primarily iodine, from the containment atmosphere following a design basis LOCA in order to minimize offsite radiological consequences and to reduce the pressure in the containment atmosphere at a rate which will ensure that the design leakage is not exceeded. CS System equipment and components include the CS pumps 1(2)CS01PA/B and associated valves/components.

The purpose of the AFW system is to provide adequate cooling water to the steam generators in the event of a LOOP and/or plant accident. The AFW System provides enough feedwater to cool the reactor down safely to the temperature at which the RHR System can be utilized. AFW System equipment and components include AFW pumps 1(2)AF01PA/B and associated valves/components.

The purpose of the Component Cooling Water (CCW) system is to provide cooling water to various plant components during normal operation, plant shutdown and after an accident, and to act as an intermediate system between the components being cooled (some of which may contain radioactive material) and the Essential Service Water (SX) system, in order to minimize possible leakage of radioactive material into the environment. CCW System equipment and components include CCW pumps 1(2)CC01PA/B and 0CC01P and associated valves/components.

The purpose of the Main Control Room HVAC (VC) system is to provide environmental conditions conducive to habitability and long component life in the Main Control Room for both Units 1 and 2 under normal and accident conditions. The purpose of the remaining plant ventilation systems is to limit the temperature and relative humidity in their respective areas in conformance with the requirements of equipment located in those areas.

The purpose of the SX system is to ensure that sufficient cooling capacity is available to provide adequate cooling during normal and accident conditions. The SX heat loads are listed in UFSAR Table 9.2-1 and include the DG coolers, Reactor Containment Fan Coolers (RCFCs), and CCW heat exchangers. SX system equipment and components include SX pumps 1(2)SX01PA/B and associated valves/components.

Other miscellaneous, non-rotating equipment evaluated includes battery chargers, inverters, heaters (including pressurizer heaters) and miscellaneous 120 V loads. The purpose of the battery chargers and inverters is to ensure that Safety-Related instrument power will be available in the event of a loss of the normal power source. The purpose of the heaters is to maintain a habitable environment in the Main Control Room. The pressurizer heaters ensure sufficient heater capacity is available to stabilize pressurizer pressure and preclude boiling in the reactor coolant system following loss of offsite power. The loads fed from the 120 VAC distribution system include solenoids, instrument panels, smoke detectors, level switches, radiation monitoring equipment, damper actuators, HVAC process instruments, Main Control Room chiller devices, Post LOCA hydrogen monitoring panel, relays, and Heated Junction Thermocouple (HJTC) panel.

EGC evaluated the impact on each of the above parameters against the current design requirements. The evaluation confirmed that the DG voltage and frequency variations are within the components' ratings and design requirements. The evaluation determined the impact of DG frequency and voltage variations on flow acceptance criteria values for all Safety-Related pumps used for surveillance and determined that DG frequency and voltage variations will not have a significant impact.

Based on the results of the above evaluation, revisions of the affected Braidwood and Byron calculations were prepared to incorporate pump speed uncertainty due to DG frequency and voltage variation into the calculation of the ECCS pump maximum and minimum acceptance criteria curves for IST, using the methodology from WCAP-17308-NP-A. The pumps affected are Centrifugal Charging pumps 1(2)CV01PA/B, SI pumps 1(2)SI01PA/B, Residual Heat Removal (RHR) pumps 1(2)RH01PA/B and Containment Spray (CS) pumps 1(2)CS01PA/B. The calculations conclude that the affected equipment meet the revised acceptance criteria. All affected pumps fall within analytical limits; therefore, they have sufficient NPSH margin after the proposed frequency and voltage tolerance change. In addition, a revision of the affected calculations were prepared to determine the maximum and minimum IST ranges for comprehensive testing of the motor-driven AFW pumps 1(2)AF01PA based on the maximum and minimum analytical pump curves, which are adjusted based on instrument uncertainty during testing as well as DG frequency and voltage tolerances.

All pumps powered from the DGs are required to operate within their acceptable bands of performance with regard to flow rate and head (discharge pressure), when powered at the allowable limits of voltage (±5%) and frequency (±0.5 Hz), without subjecting the systems to overpressure or failing to meet the minimum required system flow rates. New pump performance curves will be implemented in accordance with the IST program. The following pumps were evaluated with respect to IST acceptance criteria:

- Motor-Driven Auxiliary Feedwater pumps
- Containment Spray pumps
- Safety Injection pumps
- Centrifugal Charging pumps
- Residual Heat Removal pumps

The effect of DG voltage / frequency variation was applied to the speeds of a number of other pumps. The decrease in pump performance with decreased speed was transformed into a corresponding change in flow. The percentage change in flow due to DG voltage and frequency variation was found for each pump and the maximum percentage change in flow due to DG voltage / frequency variation was reported. This provides the percentage increase from the established / surveillance flow values required to account for the effects of DG voltage and frequency variation. The following pumps were evaluated by this alternative method:

- Component Cooling Water pumps
- Essential Service Water pumps

Flow rates and flow paths are established during the event as prescribed by the response procedures for these systems. The effect of DG performance variation was assessed, and the resulting pump performance was verified to meet anticipated system demand curves.

Variations within the proposed steady-state voltage and frequency tolerances will not trip any low pressure switches associated with the affected pumps or lift any relief valves located on the discharge piping of affected pumps.

The CC system is designed to provide 5000 gpm of flow through the RH heat exchangers. Since the RH heat exchanger throttle valves are adjusted to approximately 35% open in Braidwood and Byron site procedures, significant flow adjustment capability exists for the valves and therefore the CC system. If flow is less than 5000 gpm through the RH heat exchanger after the CC system non-essential loads are isolated per Braidwood and Byron site procedures, operators would be dispatched by those procedures to adjust the RH heat exchanger throttle valves to achieve the required flow. UFSAR Table 6.3-7 discusses this evolution to establish CC flow to the RH heat exchangers. It is recognized that the system can be operated in several configurations. UFSAR Table 6.3-7 refers to B(w)EP ES-1.3, "Transfer to Cold Leg Recirculation," which directs establishment and verification of CC flow through the RH Heat Exchangers such that additional manual actions may be necessary to achieve the required flow. Therefore, this same process will continue to be followed to ensure adequate flow is provided to the RH heat exchangers, and no procedure revisions or acceptance criteria revisions are required for the CC System.

The SX system is similar in that system configuration and flows are widely adjustable. However, since the RCFC throttle valves are located inside containment and would not be accessible during accident conditions, the SX pump flow "As Left" values documented within the Braidwood and Byron site surveillance procedures will be increased by at least 1.4% in compensation for the potential 1.4% reduction in flow due to DG frequency and voltage variation. This will ensure that the required minimum SX flow to each RCFC would continue to be met at DG minimum steady-state frequency and voltage conditions.

All MOVs powered from the DGs are required to operate within required stroke times at minimum frequency and to operate without overstress at the maximum frequency. All fans powered from the DGs are required to provide the required system design flow with adequate margins at minimum frequency (59.5 Hz) and voltage 456 V (480 V, -5%). For Byron, Essential Service Water Cooling Tower (SXCT) fans 0SX03CA through 0SX03CH, the reduction in fan speed at minimum frequency and voltage will cause the cold water outlet temperature from the tower to increase by approximately 0.2°F, which will not have a significant impact on the SX system performance.

Per WCAP-17308-NP-A, Sections 2.5 and 4, the torque developed by a motor is proportional to the square of the terminal voltage. The torque developed by a motor is inversely proportional to the square of the power supply frequency. A higher than nominal frequency would increase the speed of the motor while a lower frequency would slow the motor speed. All rotating machinery powered by the DG would be affected by a change in frequency in a similar manner. The net effect of voltage and frequency variations on steady-state speed can be approximated using the methodology presented in WCAP-17308-NP-A.

Per WCAP-17308-NP-A, Section 5, if the fan speed and corresponding airflow do not vary more than ±10% of the specified system flow rate due to the effects of DG frequency and voltage variation, the fan for that system is concluded to be performing within its expected operating range.

3.2 Impact on DG Loading

The impacts of frequency and voltage variations on the DG loading calculations were evaluated using the methodology outlined in Section 3.1 of WCAP-17308-NP-A. Calculation revisions related to DG loading were not required since they already reflect DG operation at a bounding frequency of 60.5 Hz.

The total DG load for a loss of coolant accident coincident with a loss of offsite power is within the continuous duty rating. Each of the DGs is a Cooper-Bessemer Model KSV-20-T rated at 7680 hp at 600 rpm, with a continuous rating of 5500 kW (6875 kVA, 0.8 power factor), per UFSAR Section 8.3.1.1.2.2, UFSAR Section 8.1.2, and UFSAR Table 8.3-5. The DGs currently must be capable of starting and reaching rated voltage (-5%) and rated frequency (-2%) within 10 seconds upon receipt of an ESF signal.

TS 3.8.1 is being revised to reduce the tolerance for DG frequency during steady-state operation to ±0.5 Hz (i.e., 59.5 Hz to 60.5 Hz, or ±0.83%), as opposed to the ±2% tolerance (58.8 Hz to 61.2 Hz). TS 3.8.1 is also being revised to reduce the tolerance for DG voltage during steady-state operation to (±5%) (i.e., 3950 V to 4370 V), as opposed to the (+10/-5%) tolerance (3950 V to 4580 V). The performance requirements of the driven pumps, fans/blowers, MOVs, and other equipment are not being changed.

EGC evaluated in detail the following miscellaneous loads to ensure the DG frequency and voltage variances are acceptable:

- 125 VDC Battery Chargers
- UPS Inverters
- Required Heaters (including pressurizer heaters)
- 120 VAC Loads
- Control Room Refrigeration Units and MCR chilled water (WO) pumps
- Containment Hydrogen Monitoring System Sample pumps
- Lighting
- Main Steam and Feedwater Isolation Valves

3.3 Impact on DG Fuel Oil Consumption Calculations

A calculated change in DG loading due to steady-state variation in frequency also requires an evaluation of the impact on fuel oil consumption and stored fuel requirements as a result of the change in loading in accordance with WCAP-17308-NP-A, Section 3.2.

The current DG fuel consumption calculation accounts for the DGs operating at 60.5 Hz. The calculation accounts for all continuously operating components powered by the DGs during accident conditions, and the loads for all inductive motors are increased proportionally to the change in speed cubed to account for the increased DG frequency. As the current analysis already accounts for an DG frequency of 60.5 Hz, no additional analysis is required to account for DG steady-state frequency and voltage variations.

3.4 Impact on MOV Performance

EGC calculations addressed the effects of the TS allowed variation in DG frequency and voltage on MOVs. The allowed frequency and voltage variations are being reduced. The calculations analyze the effects of frequency variations of ±0.5 Hz (±0.83%) and voltage variations of ±5% on driven loads. The motor speeds change in proportion to the frequency and to a lesser extent the slip speed is affected by motor voltage. MOVs are evaluated for the effects of the motor speed changes.

As part of prior evaluations for NRC Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," (including Supplements 1 through 7) and NRC GL 96-05, "Periodic Verification of Design Basis Capability of Safety-Related Motor-Operated Valves," the MOVs were evaluated for the lowest voltage.

WCAP-17308-NP-A, Section 4.1 evaluates that reduced DG frequency will slow the MOV motor speed and increase valve stroke time. It concludes that the impact of increased (sic) MOV stroke time caused by a decrease in motor speed due to a lower than nominal frequency will not adversely affect MOV performance as the change in MOV speed will be insignificant. An increase in DG frequency would cause the MOV to stroke faster. As the stroke time impact is insignificant, WCAP-17308-NP-A also concludes than an increase in motor speed due to a higher than nominal frequency will not adversely affect valve performance. Therefore, these were not evaluated further by EGC.

Reduced DG voltage will decrease the torque / thrust capabilities of the MOVs. As part of calculations performed to comply with GL 96-05, MOV calculations are based on worst-case degraded voltage conditions. The current Byron and Braidwood AC MOV calculations account for degraded voltages at the MOVs. As the DG steady-state under-voltage is greater than the degraded voltage condition analyzed in the MOV calculations, additional analysis is not required in accordance with WCAP-17308-NP-A, Section 4.3.

Increased DG voltage will increase the torque capabilities of the MOVs. As the MOV torque will be limited by either a torque switch or limit switch setting, this will not impact normal MOV operation. Increased DG voltage beyond the nominal voltage rating of the MOV motors would cause the current of the motor load circuits to decrease. Voltage variation of the DG at steady-state operating is confirmed to be within the allowable operating voltage range of the MOV motors to ensure there is no adverse impact on the MOV motors from the maximum expected steady-state voltage in accordance with WCAP-17308-NP-A, Section 4.3.

DG over-frequency will increase pump discharge pressure, which will raise the associated piping system line pressure. An increase in line pressure creates a greater differential pressure across an MOV. An increase in frequency increases pump rotational speed, which increases horsepower based on affinity laws. An increase in pump rotational speed increases pump developed head using affinity laws. An increase in pump head results in an increase in thrust or torque required to operate the valve.

The system head calculations on which the dP is based were based on the TS minimum and maximum allowable pump curves. Pump IST acceptance criteria and comparison to existing test results were evaluated using the methodology outlined in Section 4.4 of WCAP-17308-NP-A, and the maximum allowed pump curves are not being increased. The TS limits are maintained, but the test acceptance criteria are being adjusted for variation in the pump motor frequency so that there is a more limiting acceptance window. Since the TS limits are not changed and the system head is based on the maximum allowed pump curve, the design system operating pressures are not being increased.

Therefore, the design dP across the MOVs will not be increased due to increased DG frequency, and the MOVs are not impacted by the reanalysis of the pumps.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

Appendix A, "General Design Criteria for Nuclear Power Plants," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR)

Criterion 17 – Electrical power systems. An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and

containment integrity and other vital functions are maintained in the event of postulated accidents.

The onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.

Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights of way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A switchyard common to both circuits is acceptable. Each of these circuits shall be designed to be available in sufficient time following a loss of all onsite alternating current power supplies and the other offsite electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded. One of these circuits shall be designed to be available within a few seconds following a loss-of-coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained.

Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.

Criterion 18 – Inspection and testing of electric power systems. Electric power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation, connections, and switchboards, to assess the continuity of the systems and the condition of their components. The systems shall be designed with a capability to test periodically (1) the operability and functional performance of the components of the systems, such as onsite power sources, relays, switches, and buses, and (2) the operability of the systems as a whole and, under conditions as close to design as practical, the full operation sequence that brings the systems into operation, including operation of applicable portions of the protection system, and the transfer of power among the nuclear power unit, the offsite power system, and the onsite power system.

10 Code of Federal Regulations (CFR)

§ 50.36(c)(3) Surveillance requirements. Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

NRC Regulatory Guides

Regulatory Guide 1.9, "Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (onsite) Electric Power Systems at Nuclear Power Plants" specifies the required minimum frequency during transients and the minimum steady-state frequency requirements of DGs. EGC conforms to Regulatory Guide 1.9, Revision 3.

Guidance Document

Westinghouse Electric Company LLC Report WCAP-17308-NP-A, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances," Revision 0 (ADAMS Accession No. ML17215A230).

EGC used the methodology outlined in WCAP-17308-NP-A to address the issue of DG frequency and voltage variation in the EGC safety analyses. The NRC found the WCAP methodology acceptable, as stated in the last sentence of the NRC's Safety Evaluation (Reference 3).

EGC Discussion

The proposed change is to narrow the current Technical Specification surveillance acceptance criteria range for steady-state voltage and frequency (i.e., the proposed change provides more restrictive acceptance criteria). If the proposed change is approved, the GDC 17; GDC 18; and § 50.36(c)(3) requirements would continue to be met. The proposed steady-state voltage and frequency values would remain compliant with existing UFSAR design bases that rely on Regulatory Guide 1.9, Revision 3. Therefore, the proposed change is consistent with the above listed applicable regulatory requirements/criteria. The DGs are not initiators for accidents evaluated in the UFSAR. The proposed changes do not alter the capability of the DGs or their supporting systems to start, load, and perform their intended design functions. The proposed changes do not impact the mitigation of design basis accidents. The DG TS Surveillance Requirements confirm the capability of each DG to start and achieve the conditions required to accept the loads determined in the accident analysis. The proposed changes do not revise the DG operating philosophy and testing frequency nor do the proposed changes affect how the DGs are operated or physically tested. If the proposed changes are approved, the DGs would continue to perform their intended safety functions in accordance with the safety analysis. Therefore, the proposed changes do not affect safety analysis assumptions.

4.2 Precedent

The following precedent applies to the Braidwood and Byron application to revise TS 3.8.1, "AC Sources-Operating:"

- Letter from G. Edward Miller (U.S. Nuclear Regulatory Commission) to G. T. Powell (STP Nuclear Operating Company), "South Texas Project, Units 1 and 2 – Issuance of Amendment Nos. 216 and 202 Re: Standby Diesel Generator Surveillance Requirements (EPID L-2018-LLA-0078)," dated August 20, 2019 (ADAMS Accession No. ML19213A147 – Reference 4)

4.3 No Significant Hazards Consideration

In accordance with 10 CFR 50.90, Exelon Generation Company, LLC (EGC), is submitting a request for amendments to the Technical Specifications (TS) for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2. The proposed changes would revise the Renewed Facility Operating Licenses to modify Technical Specifications (TS) 3.8.1, "AC Sources-Operating," to revise certain minimum and maximum voltage and frequency acceptance criteria for steady-state standby diesel generator surveillance testing.

The license amendment request is required to correct a non-conservative TS. Plant operations are currently administratively controlled as described in NRC Administrative Letter (AL) 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety." In accordance with the guidance in AL 98-10, this license amendment request is required to resolve non-conservative TS and is not a voluntary request to change the Braidwood and Byron Stations' licensing basis. Therefore, this request is not subject to "forward fit" considerations as described in a letter from S. G. Burns (NRC, General Counsel) to E. C. Ginsberg (NEI), dated July 14, 2010 (ADAMS Accession No. ML101960180).

EGC has evaluated whether or not a significant hazards consideration is involved with the proposed amendments for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, by focusing on the three standards set forth in 10 CFR 50.92(c), "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The DGs are not initiators for any accidents evaluated in the Updated Final Safety Analysis Report (UFSAR). The proposed change provides a more conservative range of acceptable DG voltage and frequency values. Thus, TS Surveillance Requirements will continue to demonstrate sufficient margin such that mitigation of accidents evaluated in the UFSAR is not impacted. The proposed change does not alter the design function of the DGs, nor does it affect how the DGs are operated or physically tested. Therefore, the proposed change does not involve an increase in the probability or consequences of an accident previously evaluated.

   Therefore, this proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed change does not involve any physical alterations and no new or different types of equipment are being installed. Requiring a more conservative range of acceptable DG voltage and frequency values does not affect DG operations and does not affect the ability of the DGs to perform their design function. There are no new credible failure mechanisms, malfunctions, or accident initiators introduced as a result of the proposed change. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in margin of safety?

   Response: No.

   Since the proposed change provides a more conservative range of acceptable DG voltage and frequency values, the margin of safety is maintained. Where required, TS Surveillance Requirements acceptance criteria have been procedurally adjusted to ensure equipment performance meets accident analysis assumptions considering uncertainties in steady-state DG voltage and frequency. EGC has evaluated the effects of DG voltage and frequency variations on affected equipment and confirmed that the design basis analyses are not adversely affected. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, EGC concludes that the proposed amendments do not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of no significant hazards consideration is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendments would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendments do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendments meet the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendments.

6.0 REFERENCES

1) Letter from R. C. Daley (U.S. Nuclear Regulatory Commission) to M. J. Pacilio (Exelon Nuclear), "Byron Station, NRC Evaluation of Changes, Tests, or Experiments or Permanent Plant Modifications Baseline Inspection Report 05000454/2011009; 05000455/2011009(DRS)," dated July 22, 2011

2) WCAP-17308-NP-A, Revision 0, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances," dated July 2017

3) Letter from K. Hsueh (U.S. Nuclear Regulatory Commission) to W. A. Nowinowski (Westinghouse Electric Company), "Final Safety Evaluation for Pressurized Water Reactor Owners Group Topical Report WCAP-17308-NP, Revision 0, 'Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances' (TAC No. ME8689)," dated April 17, 2017

4) Letter from G. Edward Miller (U.S. Nuclear Regulatory Commission) to G. T. Powell (STP Nuclear Operating Company), "South Texas Project, Units 1 and 2 – Issuance of Amendment Nos. 216 and 202 Re: Standby Diesel Generator Surveillance Requirements (EPID L-2018-LLA-0078)," dated August 20, 2019 (ADAMS Accession No. ML19213A147)

ATTACHMENT 2
Proposed Technical Specifications Changes for Braidwood Station, Units 1 and 2

Braidwood Station, Units 1 and 2

Renewed Facility Operating License Nos. NPF-72 and NPF-77

Mark-up of Technical Specifications Pages

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required qualified circuit.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.2	----------NOTE---------- A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. Performance of SR 3.8.1.7 satisfies this SR. ---------- Verify each DG starts from standby condition and achieves steady state voltage ≥ 3950 V and ≤ ~~4580~~ 4370 V and frequency ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.3	----------NOTES---------- 1. DG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients outside the load range do not invalidate this test. 3. This Surveillance shall be conducted on only one DG at a time. 4. This Surveillance shall be preceded by and immediately follow without shutdown a successful performance of SR 3.8.1.2 or SR 3.8.1.7. ---------- Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each day tank contains ≥ 450 gal of fuel oil.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to automatically transfer fuel oil from storage tank(s) to the day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.7	Verify each DG starts from normal standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ ~~4580~~ 4370 V, and frequency ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.8	Verify manual transfer of AC power sources from the required normal qualified circuit(s) to the reserve required qualified circuit(s).	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.9	----------NOTE---------- This Surveillance shall not be performed in MODE 1 or 2. ---------- Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ 64.5 Hz; b. Following load rejection, the steady state voltage is maintained ≥ 3950 V and ≤ ~~4580~~ 4370 V; and c. Following load rejection, the steady state frequency is maintained ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.10	----------NOTES---------- 1. Momentary transients above the voltage limit immediately following a load rejection do not invalidate this test. 2. This Surveillance shall not be performed in MODE 1 or 2. 3. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.89. However, if grid conditions do not permit, the power factor limit is not required to be met. Under this condition the power factor shall be maintained as close to the limit as practicable. ---------- Verify each DG does not trip and voltage is maintained ≤ 5600 V during and following a load rejection of ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of ESF buses; b. Load shedding from ESF buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected shutdown loads through the shutdown load sequence timers, 3. maintains steady state voltage ≥ 3950 V and ≤ ~~4580~~ V, 4370 4. maintains steady state frequency ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz, and 5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and: a. In ≤ 10 seconds achieves voltage ≥ 3950 V and frequency ≥ 58.8 Hz; b. Achieves steady state voltage ≥ 3950 V and ≤ ~~4580~~ 4370 V and frequency ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz; and c. Operates for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.13	Verify each DG's automatic trips are bypassed on actual or simulated loss of voltage signal on the emergency bus concurrent with an actual or simulated ESF actuation signal except: a. Engine overspeed; and b. Generator differential current.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.14	----------NOTE---------- Momentary transients outside the load range do not invalidate this test. ---------- Verify each DG operates for ≥ 24 hours: a. For ≥ 2 hours loaded ≥ 5775 kW and ≤ 6050 kW; and b. For the remaining hours of the test loaded ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.15	----------NOTES---------- 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 4950 kW and ≤ 5500 kW or until operating temperature has stabilized. 2. Momentary transients outside of load range do not invalidate this test. ---------- Verify each DG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ ~~4580~~ V, and frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.	In accordance with the Surveillance Frequency Control Program

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(continued)

NO CHANGES TO THIS PAGE

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.17	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify, with a DG operating in test mode and connected to its bus, an actual or simulated ESF actuation signal overrides the test mode by: a. Returning DG to ready-to-load operation; and b. Automatically energizing the emergency load from offsite power.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.18	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify interval between each sequenced load block is within ± 10% of design interval for each safeguards and shutdown sequence timer.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.19	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal: a. De-energization of ESF buses; b. Load shedding from ESF buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through the safeguards sequence timers, 3. achieves steady state voltage ≥ 3950 V and ≤ ~~4580~~ V, 4370 4. achieves steady state frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz, and 59.5 60.5 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.20	Verify when started simultaneously from standby condition, each DG achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ ~~4580~~ V, and frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz. 4370 60.5 59.5	In accordance with the Surveillance Frequency Control Program

ATTACHMENT 3
Proposed Technical Specifications Changes for Byron Station, Units 1 and 2

Byron Station, Units 1 and 2

Renewed Facility Operating License Nos. NPF-37 and NPF-66

Mark-up of Technical Specifications Pages

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required qualified circuit.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.2	----------NOTE---------- A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. Performance of SR 3.8.1.7 satisfies this SR. ---------- Verify each DG starts from standby condition and achieves steady state voltage ≥ 3950 V and ≤ ~~4580~~ 4370 V and frequency ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.3	----------NOTES---------- 1. DG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients outside the load range do not invalidate this test. 3. This Surveillance shall be conducted on only one DG at a time. 4. This Surveillance shall be preceded by and immediately follow without shutdown a successful performance of SR 3.8.1.2 or SR 3.8.1.7. ---------- Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each day tank contains ≥ 450 gal of fuel oil.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to automatically transfer fuel oil from storage tank(s) to the day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.7	Verify each DG starts from normal standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ ~~4580~~ V, and frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.8	Verify manual transfer of AC power sources from the required normal qualified circuit(s) to the reserve required qualified circuit(s).	In accordance with the Surveillance Frequency Control Program

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(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.8.1.9 ----------NOTE---------- This Surveillance shall not be performed in MODE 1 or 2. ---------- Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ 64.5 Hz; b. Following load rejection, the steady state voltage is maintained ≥ 3950 V and ≤ ~~4580~~ 4370 V; and c. Following load rejection, the steady state frequency is maintained ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.10 ----------NOTES---------- 1. Momentary transients above the voltage limit immediately following a load rejection do not invalidate this test. 2. This Surveillance shall not be performed in MODE 1 or 2. 3. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.89. However, if grid conditions do not permit, the power factor limit is not required to be met. Under this condition the power factor shall be maintained as close to the limit as practicable. ---------- Verify each DG does not trip and voltage is maintained ≤ 5600 V during and following a load rejection of ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of ESF buses; b. Load shedding from ESF buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected shutdown loads through the shutdown load sequence timers, 3. maintains steady state voltage ≥ 3950 V and ≤ ~~4580~~ V, 4370 4. maintains steady state frequency ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz, and 5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and: a. In ≤ 10 seconds achieves voltage ≥ 3950 V and frequency ≥ 58.8 Hz; b. Achieves steady state voltage ≥ 3950 V and ≤ ~~4580~~ 4370 V and frequency ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz; and c. Operates for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.13	Verify each DG's automatic trips are bypassed on actual or simulated loss of voltage signal on the emergency bus concurrent with an actual or simulated ESF actuation signal except: a. Engine overspeed; and b. Generator differential current.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.14	----------NOTE---------- Momentary transients outside the load range do not invalidate this test. ---------- Verify each DG operates for ≥ 24 hours: a. For ≥ 2 hours loaded ≥ 5775 kW and ≤ 6050 kW; and b. For the remaining hours of the test loaded ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.8.1.15 ----------NOTES---------- 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 4950 kW and ≤ 5500 kW or until operating temperature has stabilized. 2. Momentary transients outside of load range do not invalidate this test. ---------- Verify each DG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ ~~4580~~ 4370 V, and frequency ≥ ~~58.8~~ 59.5 Hz and ≤ ~~61.2~~ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16 ----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.	In accordance with the Surveillance Frequency Control Program

(continued)

NO CHANGES TO THIS PAGE

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.17	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify, with a DG operating in test mode and connected to its bus, an actual or simulated ESF actuation signal overrides the test mode by: a. Returning DG to ready-to-load operation; and b. Automatically energizing the emergency load from offsite power.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.18	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify interval between each sequenced load block is within ± 10% of design interval for each safeguards and shutdown sequence timer.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.19	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal: a. De-energization of ESF buses; b. Load shedding from ESF buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through the safeguards sequence timers, 3. achieves steady state voltage ≥ 3950 V and ≤ ~~4580~~ V, 4370 4. achieves steady state frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz, and 59.5 60.5 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.20	Verify when started simultaneously from standby condition, each DG achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ ~~4580~~ V, and frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz. 4370 60.5 59.5	In accordance with the Surveillance Frequency Control Program

ATTACHMENT 4
Proposed Technical Specifications Bases Changes for Braidwood Station, Units 1 and 2

Braidwood Station, Units 1 and 2

Renewed Facility Operating License Nos. NPF-72 and NPF-77

Mark-up of Technical Specifications Bases Pages

BASES

SURVEILLANCE REQUIREMENTS

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, in accordance with 10 CFR 50, Appendix A, GDC 18 (Ref. 9). Periodic component tests are supplemented by extensive functional tests during refueling outages (under simulated accident conditions). The SRs for demonstrating the OPERABILITY of the DGs are in general conformance with the recommendations of Regulatory Guide 1.9 (Ref. 3), and Regulatory Guide 1.137 (Ref. 11), as addressed in the UFSAR.

~~Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum steady state output voltage of 3950 V is 95% of the nominal 4160 V output voltage. This value allows for voltage drop to the terminals of 4000 V motors whose minimum operating voltage is specified as 90% or 3600 V. It also allows for voltage drops to motors and other equipment down through the 120 V level where minimum operating voltage is also usually specified as 90% of name plate rating. The specified maximum steady state output voltage of 4580 V is equal to the maximum operating voltage specified for 4000 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 V motors is no more than the maximum rated operating voltages. The specified minimum and maximum frequencies of the DG are 58.8 Hz and 61.2 Hz, respectively. These values are equal to ± 2% of the 60 Hz nominal frequency and are derived from the recommendations given in Regulatory Guide 1.9 (Ref. 3).~~

SR 3.8.1.1

This SR ensures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its correct position to ensure that distribution buses and loads are connected to their preferred power source, and that appropriate independence of offsite circuits is maintained. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.2 and SR 3.8.1.7

These SRs help to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and to maintain the unit in a safe shutdown condition.

Each SR 3.8.1.2 and SR 3.8.1.7 DG start requires the DG to achieve and maintain a steady state voltage and frequency range. The start signals used for this test may consist of one of the following signals:

a. Manual;

b. Simulated loss of ESF bus voltage by itself;

c. Simulated loss of ESF bus voltage in conjunction with an ESF actuation test signal; or

d. An ESF actuation test signal by itself.

For the purpose of SR 3.8.1.2 testing, the DGs are started from standby conditions. Standby conditions for a DG mean that the diesel engine coolant and oil are being continuously circulated and temperature is being maintained consistent with manufacturer's recommended operating range (low lube oil and jacket water temperature alarm settings to the high lube oil and jacket water temperature alarm settings).

For the purposes of SR 3.8.1.7 testing, the DGs are started from normal standby conditions. Normal standby conditions for a DG mean that the diesel engine coolant and oil are being circulated (i.e., coolant is circulated based on temperature and oil is circulated continuously) and temperature is being maintained within the prescribed temperature bands of these subsystems when the diesel generator has been at rest for an extended period of time with the prelube oil and jacket water circulating systems operational. The prescribed temperature band is 110°F - 150°F which accounts for instrument tolerances. ~~DG starts for these Surveillances are followed by a warmup period prior to loading.~~

For the purposes of SR 3.8.1.2 and SR 3.8.1.7, DG starts for these Surveillances are followed by a warmup period prior to loading.

BASES

SURVEILLANCE REQUIREMENTS (continued)

In order to reduce stress and wear on diesel engines, a modified start is used in which the starting speed of DGs is limited, warmup is limited to this lower speed, and the DGs are gradually accelerated to synchronous speed prior to loading. These start procedures are the intent of starts in accordance with SR 3.8.1.2.

SR 3.8.1.7 requires that the DG starts from normal standby conditions and achieves required voltage and frequency within 10 seconds. The 10 second start requirement supports the assumptions of the design basis LOCA analysis in the UFSAR, Chapter 15 (Ref. 5). INSERT 1

The 10 second start requirement is not applicable to SR 3.8.1.2 (see SR Note) when a modified start procedure as described above is used. If a modified start is not used, the 10 second start requirement of SR 3.8.1.7 applies.

INSERT 2

Since SR 3.8.1.7 requires a 10 second start, it is more restrictive than SR 3.8.1.2, and it may be performed in lieu of SR 3.8.1.2. This is also addressed in SR 3.8.1.2 Note.

In addition to the SR requirements, the time for the DG to reach steady state operation, unless the modified DG start method is employed, is periodically monitored and the trend evaluated to identify degradation of governor and voltage regulator performance.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.3

This Surveillance verifies that the DGs are capable of synchronizing with the offsite electrical system and accepting loads greater than or equal to the equivalent of the maximum expected accident loads. A minimum run time of 60 minutes is required to stabilize engine temperatures.

Although no power factor requirements are established by this SR, the DG is normally operated between 0 and 1000 kVARs. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by four Notes. Note 1 indicates that diesel engine runs for this Surveillance may include gradual loading, as recommended by the manufacturer, so that mechanical stress and wear on the diesel engine are minimized. Note 2 states that momentary transients (e.g., changing bus loads) do not invalidate this test. Similarly, momentary kVAR transients outside of the specified range do not invalidate the test. Note 3 indicates that this Surveillance should be conducted on only one DG at a time in order to avoid common cause failures that might result from offsite circuit or grid perturbations. Note 4 stipulates a prerequisite requirement for performance of this SR. A successful DG start must precede this test to credit satisfactory performance.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the day tank is at or above the level at which fuel oil is automatically added. The level is expressed as an equivalent volume in gallons, and is selected to ensure adequate fuel oil for a minimum of 1 hour of DG operation at full load plus 10%.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.5

Microbiological fouling is a major cause of fuel oil degradation. There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel oil day tanks eliminates the necessary environment for bacterial survival. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and breakdown of the fuel oil by bacteria. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. This SR is for preventative maintenance. The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during the performance of this Surveillance.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.6

This Surveillance demonstrates that each required (one of two transfer pumps per DG is "required" to support DG OPERABILITY) fuel oil transfer pump operates and transfers fuel oil from its associated storage tank(s) to its associated day tank. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, the fuel delivery piping is not obstructed, and the controls and control systems for automatic fuel transfer systems are OPERABLE.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.8

Transfer of each 4.16 kV ESF bus power supply from the normal offsite circuit to the alternate offsite circuit demonstrates the OPERABILITY of the alternate circuit distribution network to power the shutdown loads. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.9

Each DG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause diesel engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the DG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. The single largest post-accident load associated with each DG is the Essential Service Water (SX) pump (1040 kW at full load conditions). This Surveillance is accomplished by simultaneously tripping loads supplied by the DG which have a minimum combined load equivalent to the single largest post-accident load. This method is employed due to the difficulty of attaining SX full load conditions during normal plant operations.

INSERT 3

As required by Regulatory Guide 1.9 (Ref. 3), the load rejection test is acceptable if the increase in diesel speed does not exceed 75% of the difference between synchronous speed and the overspeed trip setpoint (64.5 Hz), or 15% above synchronous speed (69 Hz), whichever is lower.

The voltage and frequency tolerances specified in this SR are derived from Regulatory Guide 1.9 (Ref. 3) recommendations for response during load sequence intervals. The voltage and frequency specified are consistent with the design range of the equipment powered by the DG. SR 3.8.1.9.a corresponds to the maximum frequency excursion, while SR 3.8.1.9.b and SR 3.8.1.9.c are steady state voltage and frequency values to which the system must recover following load rejection. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The reason for the Note is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, plant safety systems.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.10

This Surveillance demonstrates the DG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The DG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine/generator response under the simulated test conditions. This test simulates a full load rejection and verifies that the DG does not trip upon loss of the load. These acceptance criteria provide for DG damage protection. While the DG is not expected to experience this transient during an event and continues to be available, this response ensures that the DG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR has been modified by three Notes. Note 1 states that momentary transients above the stated voltage limit immediately following a load rejection (i.e., the DG full load rejection) do not invalidate this test. The momentary transient is that which occurs immediately after the circuit breaker is opened, lasts a few milliseconds, and may or may not be observed on voltage recording or monitoring instrumentation. The reason for Note 2 is that during operation with the reactor critical, performance of this SR could cause perturbation to the electrical distribution systems that could challenge continued steady state operation and, as a result, plant safety systems. Note 3 ensures that the DG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ 0.89. This power factor is representative of the actual inductive loading a DG would experience under design basis accident conditions. Under certain conditions; however, Note 3 allows the Surveillance to be conducted at a power factor other than ≤ 0.89. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.89 results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to 0.89 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the DG excitation levels needed to obtain a power

BASES

SURVEILLANCE REQUIREMENTS (continued)

factor of 0.89 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained as close as practicable to 0.89 without exceeding the DG excitation limits.

SR 3.8.1.11

In general conformance with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.4, this Surveillance demonstrates the as designed operation of the standby power sources during loss of the offsite source. This test verifies all actions encountered from the loss of offsite power, including shedding of the nonessential loads and energization of the emergency buses and respective loads from the DG. It further demonstrates the capability of the DG to automatically achieve the required voltage and frequency within the specified time, and maintain a steady state voltage and frequency range.

The DG autostart time of 10 seconds is derived from requirements of the accident analysis to respond to a design basis large break LOCA. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability is achieved.

The requirement to verify the connection and power supply of permanent and autoconnected loads is intended to satisfactorily show the relationship of these loads to the DG loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, ECCS injection valves are not desired to be stroked open, or high pressure injection systems are not capable of being operated at full flow, or Residual Heat Removal (RHR) systems performing a decay heat removal function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the DG systems to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

INSERT 4 →

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.12

This Surveillance demonstrates that the DG automatically starts and achieves the required voltage and frequency within the specified time (10 seconds) from the design basis actuation signal (LOCA signal) and operates for ≥ 5 minutes. The 5 minute period provides sufficient time to demonstrate stability.

INSERT 5 →

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.13

This Surveillance demonstrates that DG noncritical protective functions (e.g., high jacket water temperature) are bypassed on a loss of voltage signal concurrent with an ESF actuation test signal. The noncritical trips are bypassed during DBAs and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately. The DG availability to mitigate the DBA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the DG.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.14

Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.9, recommends demonstration that the DGs can start and run continuously at full load capability for an interval of not less than 24 hours, ≥ 2 hours of which is at a load band equivalent to 105% to 110% of the continuous duty rating and the remainder of the time at a load equivalent to the continuous duty rating of the DG. The DG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are also applicable to this SR.

BASES

SURVEILLANCE REQUIREMENTS (continued)

In order to ensure that the DG is tested under load conditions that bound design conditions and comply with the recommendations of Regulatory Guide 1.9 (Ref. 3) paragraph 2.2.9, testing must be performed using a power factor ≥ 0.8 and ≤ 0.89. This power factor range bounds the actual design basis inductive loading the DG would experience. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This Surveillance is modified by a Note which states that momentary transients (e.g., due to changing bus loads) do not invalidate this test.

SR 3.8.1.15

This Surveillance demonstrates that the diesel engine can restart from a hot condition, such as subsequent to shutdown from normal Surveillances, and achieve the required voltage and frequency within 10 seconds. The 10 second time is derived from the requirements of the accident analysis to respond to a design basis large break LOCA. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

INSERT 6

Start new paragraph

This SR is modified by two Notes. Note 1 ensures that the test is performed with the diesel sufficiently hot. The load band is provided to avoid routine overloading of the DG. Routine overloads may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY. The requirement that the diesel has operated for at least 2 hours at full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. Alternatively, the DG can be operated until operating temperatures have stabilized. Note 2 states that momentary transients (e.g., due to changing bus loads) do not invalidate this test.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.16

As required by Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.11, this Surveillance ensures that the manual synchronization and load transfer from the DG to the offsite source can be made and the DG can be returned to ready to load status when offsite power is restored. It also ensures that the autostart logic is reset to allow the DG to reload if a subsequent loss of offsite power occurs. The DG is considered to be in ready to load status when the DG is at rated speed and voltage, the output breaker is open and can receive an autoclose signal on bus undervoltage, and the load sequence timers are reset.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.17

Demonstration of the test mode override ensures that the DG availability under accident conditions will not be compromised as the result of testing and the DG will automatically reset to ready to load operation if a LOCA actuation signal is received during operation in the test mode. Ready to load operation is defined as the DG running at rated speed and voltage with the DG output breaker open. These provisions for automatic switchover are required by IEEE-308 (Ref. 10), paragraph 6.2.6(2).

The intent in the requirement associated with SR 3.8.1.17.b is to show that the emergency loading was not affected by the DG operation in test mode. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the emergency loads to perform these functions is acceptable.

This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.18

Under accident and loss of offsite power conditions, loads are sequentially connected to the bus by the automatic load sequence timers. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The 10% load sequence time interval tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.19

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.11, during a loss of offsite power actuation test signal in conjunction with an ESF actuation signal. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

INSERT 7 →

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note. The reason for the Note is that the performance of the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.20

This Surveillance demonstrates that the DG starting independence has not been compromised. Also, this Surveillance demonstrates that each engine can achieve proper speed within the specified time when the DGs are started simultaneously.

INSERT 8 →

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. UFSAR, Chapter 8.
3. Regulatory Guide 1.9, Rev. 3, July 1993.
4. UFSAR, Chapter 6.
5. UFSAR, Chapter 15.
6. Regulatory Guide 1.93, Rev. 0, December 1974.
7. R. M. Krich to NRC Document Control Desk Letter, "Request for Amendment to Technical Specifications, to Facility Operating Licenses, Emergency Diesel Generators, Completion Time Extension and Surveillance Requirement Change," January 20, 2000.
8. Generic Letter 84-15, "Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability," July 2, 1984.
9. 10 CFR 50, Appendix A, GDC 18.
10. IEEE Standard 308-1978.
11. Regulatory Guide 1.137, Rev. 1, October 1979.

INSERT 9 →

BRAIDWOOD & BYRON BASES INSERTS

INSERT 1: SR 3.8.1.7 is consistent with the guidance for this SR contained in Section 2.2.3, "Fast Start Test," of Regulatory Guide 1.9 (Ref. 3), which requires verification that the DG "reaches required voltage and frequency within acceptable limits and time as defined in the plant technical specifications."

INSERT 2: The criteria that in ≤ 10 seconds the DG achieves ≥ 3950 V and ≥ 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria for the DG that are specified to confirm the capability of the DG to recover from a loading transient.

SR 3.8.1.2 and SR 3.8.1.7 also demonstrate that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor on the following:

- Pump flow and developed head to meet design bases requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 3: This Surveillance may be accomplished by:

a. Tripping the DG output breaker with the DG carrying greater than or equal to its associated single largest post-accident load while paralleled to offsite power, or while solely supplying the bus, or

b. Tripping its associated single largest post-accident load with the DG solely supplying the bus.

INSERT 4: SR 3.8.1.11 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 5: The criteria that in ≤ 10 seconds the DG achieves ≥ 3950 V and ≥ 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria from the DG that are specified to confirm the capability of the DG to recover from a loading transient.

SR 3.8.1.12 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 6: The criteria that in ≤ 10 seconds the DG achieves ≥ 3950 V and ≥ 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria from the DG that are specified to confirm the capability of the DG to recover from a loading transient.

SR 3.8.1.15 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 7: SR 3.8.1.19 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 8:

The criteria that in ≤ 10 seconds the DG achieves ≥ 3950 V and ≥ 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria from the DG that are specified to confirm the capability of the DG to recover from a loading transient.

SR 3.8.1.20 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 9:

12. WCAP-17308-NP-A, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances."

ATTACHMENT 5
Proposed Technical Specifications Bases Changes for Byron Station, Units 1 and 2

Byron Station, Units 1 and 2

Renewed Facility Operating License Nos. NPF-37 and NPF-66

Mark-up of Technical Specifications Bases Pages

BASES

SURVEILLANCE REQUIREMENTS

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, in accordance with 10 CFR 50, Appendix A, GDC 18 (Ref. 9). Periodic component tests are supplemented by extensive functional tests during refueling outages (under simulated accident conditions). The SRs for demonstrating the OPERABILITY of the DGs are in general conformance with the recommendations of Regulatory Guide 1.9 (Ref. 3), and Regulatory Guide 1.137 (Ref. 11), as addressed in the UFSAR.

~~Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable.~~ ~~The minimum steady state output voltage of 3950 V is 95% of the nominal 4160 V output voltage.~~ ~~This value allows for voltage drop to the terminals of 4000 V motors whose minimum operating voltage is specified as 90% or 3600 V.~~ ~~It also allows for voltage drops to motors and other equipment down through the 120 V level where minimum operating voltage is also usually specified as 90% of name plate rating.~~ ~~The specified maximum steady state output voltage of 4580 V is equal to the maximum operating voltage specified for 4000 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 V motors is no more than the maximum rated operating voltages.~~ ~~The specified minimum and maximum frequencies of the DG are 58.8 Hz and 61.2 Hz, respectively.~~ ~~These values are equal to ± 2% of the 60 Hz nominal frequency and are derived from the recommendations given in Regulatory Guide 1.9 (Ref. 3).~~

SR 3.8.1.1

This SR ensures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its correct position to ensure that distribution buses and loads are connected to their preferred power source, and that appropriate independence of offsite circuits is maintained. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.2 and SR 3.8.1.7

These SRs help to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and to maintain the unit in a safe shutdown condition.

Each SR 3.8.1.2 and SR 3.8.1.7 DG start requires the DG to achieve and maintain a steady state voltage and frequency range. The start signals used for this test may consist of one of the following signals:

a. Manual;

b. Simulated loss of ESF bus voltage by itself;

c. Simulated loss of ESF bus voltage in conjunction with an ESF actuation test signal; or

d. An ESF actuation test signal by itself.

For the purpose of SR 3.8.1.2 testing, the DGs are started from standby conditions. Standby conditions for a DG mean that the diesel engine coolant and oil are being continuously circulated and temperature is being maintained consistent with manufacturer's recommended operating range (low lube oil and jacket water temperature alarm settings to the high lube oil and jacket water temperature alarm settings).

For the purposes of SR 3.8.1.7 testing, the DGs are started from normal standby conditions. Normal standby conditions for a DG mean that the diesel engine coolant and oil are being circulated (i.e., coolant is circulated based on temperature and oil is circulated continuously) and temperature is being maintained within the prescribed temperature bands of these subsystems when the diesel generator has been at rest for an extended period of time with the prelube oil and jacket water circulating systems operational. The prescribed temperature band is 110°F - 150°F which accounts for instrument tolerances. ~~DG starts for these Surveillances are followed by a warmup period prior to loading.~~

For the purposes of SR 3.8.1.2 and SR 3.8.1.7, DG starts for these Surveillances are followed by a warmup period prior to loading.

BASES

SURVEILLANCE REQUIREMENTS (continued)

In order to reduce stress and wear on diesel engines, a modified start is used in which the starting speed of DGs is limited, warmup is limited to this lower speed, and the DGs are gradually accelerated to synchronous speed prior to loading. These start procedures are the intent of starts in accordance with SR 3.8.1.2.

SR 3.8.1.7 requires that the DG starts from normal standby conditions and achieves required voltage and frequency within 10 seconds. The 10 second start requirement supports the assumptions of the design basis LOCA analysis in the UFSAR, Chapter 15 (Ref. 5).

INSERT 1

The 10 second start requirement is not applicable to SR 3.8.1.2 (see SR Note) when a modified start procedure as described above is used. If a modified start is not used, the 10 second start requirement of SR 3.8.1.7 applies.

INSERT 2

Since SR 3.8.1.7 requires a 10 second start, it is more restrictive than SR 3.8.1.2, and it may be performed in lieu of SR 3.8.1.2. This is also addressed in SR 3.8.1.2 Note.

In addition to the SR requirements, the time for the DG to reach steady state operation, unless the modified DG start method is employed, is periodically monitored and the trend evaluated to identify degradation of governor and voltage regulator performance.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.3

This Surveillance verifies that the DGs are capable of synchronizing with the offsite electrical system and accepting loads greater than or equal to the equivalent of the maximum expected accident loads. A minimum run time of 60 minutes is required to stabilize engine temperatures.

Although no power factor requirements are established by this SR, the DG is normally operated between 0 and 1000 kVARs. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by four Notes. Note 1 indicates that diesel engine runs for this Surveillance may include gradual loading, as recommended by the manufacturer, so that mechanical stress and wear on the diesel engine are minimized. Note 2 states that momentary transients (e.g., changing bus loads) do not invalidate this test. Similarly, momentary kVAR transients outside of the specified range do not invalidate the test. Note 3 indicates that this Surveillance should be conducted on only one DG at a time in order to avoid common cause failures that might result from offsite circuit or grid perturbations. Note 4 stipulates a prerequisite requirement for performance of this SR. A successful DG start must precede this test to credit satisfactory performance.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the day tank is at or above the level at which fuel oil is automatically added. The level is expressed as an equivalent volume in gallons, and is selected to ensure adequate fuel oil for a minimum of 1 hour of DG operation at full load plus 10%.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.5

Microbiological fouling is a major cause of fuel oil degradation. There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel oil day tanks eliminates the necessary environment for bacterial survival. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and breakdown of the fuel oil by bacteria. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. This SR is for preventative maintenance. The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during the performance of this Surveillance.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.6

This Surveillance demonstrates that each required (one of two transfer pumps per DG is "required" to support DG OPERABILITY) fuel oil transfer pump operates and transfers fuel oil from its associated storage tank(s) to its associated day tank. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, the fuel delivery piping is not obstructed, and the controls and control systems for automatic fuel transfer systems are OPERABLE.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.8

Transfer of each 4.16 kV ESF bus power supply from the normal offsite circuit to the alternate offsite circuit demonstrates the OPERABILITY of the alternate circuit distribution network to power the shutdown loads. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.9

Each DG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause diesel engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the DG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. The single largest post-accident load associated with each DG is the Essential Service Water (SX) pump. The brake horsepower (BHP) and kW values for each SX pump at full load conditions from EC 622685 (Ref. ~~12~~ 13) are as follows:

1A SX Pump	1297 BHP	1020 kW
1B SX Pump	1364 BHP	1075 kW
2A SX pump	1297 BHP	1020 kW
2B SX pump	1405 BHP	1105 kW

This Surveillance is accomplished by simultaneously tripping loads supplied by the DG which have a minimum combined load equivalent to the single largest post-accident load. This method is employed due to the difficulty of attaining SX full load conditions during normal plant operations.

INSERT 3

As required by Regulatory Guide 1.9 (Ref. 3), the load rejection test is acceptable if the increase in diesel speed does not exceed 75% of the difference between synchronous speed and the overspeed trip setpoint (64.5 Hz), or 15% above synchronous speed (69 Hz), whichever is lower.

The voltage and frequency tolerances specified in this SR are derived from Regulatory Guide 1.9 (Ref. 3) recommendations for response during load sequence intervals. The voltage and frequency specified are consistent with the design range of the equipment powered by the DG.
SR 3.8.1.9.a corresponds to the maximum frequency excursion, while SR 3.8.1.9.b and SR 3.8.1.9.c are steady state voltage and frequency values to which the system must recover following load rejection. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The reason for the Note is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, plant safety systems.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.10

This Surveillance demonstrates the DG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The DG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine/generator response under the simulated test conditions. This test simulates a full load rejection and verifies that the DG does not trip upon loss of the load. These acceptance criteria provide for DG damage protection. While the DG is not expected to experience this transient during an event and continues to be available, this response ensures that the DG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR has been modified by three Notes. Note 1 states that momentary transients above the stated voltage limit immediately following a load rejection (i.e., the DG full load rejection) do not invalidate this test. The momentary transient is that which occurs immediately after the circuit breaker is opened, lasts a few milliseconds, and may or may not be observed on voltage recording or monitoring instrumentation. The reason for Note 2 is that during operation with the reactor critical, performance of this SR could cause perturbation to the electrical distribution systems that could challenge continued steady state operation and, as a result, plant safety systems. Note 3 ensures that the DG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ 0.89. This power factor is representative of the actual inductive loading a DG would experience under design basis accident conditions. Under certain conditions; however, Note 3 allows the Surveillance to be conducted at a power factor other than ≤ 0.89. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.89 results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to 0.89 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the DG excitation levels needed to obtain a power

BASES

SURVEILLANCE REQUIREMENTS (continued)

factor of 0.89 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained as close as practicable to 0.89 without exceeding the DG excitation limits.

SR 3.8.1.11

In general conformance with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.4, this Surveillance demonstrates the as designed operation of the standby power sources during loss of the offsite source. This test verifies all actions encountered from the loss of offsite power, including shedding of the nonessential loads and energization of the emergency buses and respective loads from the DG. It further demonstrates the capability of the DG to automatically achieve the required voltage and frequency within the specified time, and maintain a steady state voltage and frequency range.

The DG autostart time of 10 seconds is derived from requirements of the accident analysis to respond to a design basis large break LOCA. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability is achieved.

The requirement to verify the connection and power supply of permanent and autoconnected loads is intended to satisfactorily show the relationship of these loads to the DG loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, ECCS injection valves are not desired to be stroked open, or high pressure injection systems are not capable of being operated at full flow, or Residual Heat Removal (RHR) systems performing a decay heat removal function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the DG systems to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

INSERT 4 →

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.12

This Surveillance demonstrates that the DG automatically starts and achieves the required voltage and frequency within the specified time (10 seconds) from the design basis actuation signal (LOCA signal) and operates for ≥ 5 minutes. The 5 minute period provides sufficient time to demonstrate stability.

INSERT 5 →

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.13

This Surveillance demonstrates that DG noncritical protective functions (e.g., high jacket water temperature) are bypassed on a loss of voltage signal concurrent with an ESF actuation test signal. The noncritical trips are bypassed during DBAs and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately. The DG availability to mitigate the DBA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the DG.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.14

Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.9, recommends demonstration that the DGs can start and run continuously at full load capability for an interval of not less than 24 hours, ≥ 2 hours of which is at a load band equivalent to 105% to 110% of the continuous duty rating and the remainder of the time at a load equivalent to the continuous duty rating of the DG. The DG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are also applicable to this SR.

BASES

SURVEILLANCE REQUIREMENTS (continued)

In order to ensure that the DG is tested under load conditions that bound design conditions and comply with the recommendations of Regulatory Guide 1.9 (Ref. 3) paragraph 2.2.9, testing must be performed using a power factor ≥ 0.8 and ≤ 0.89. This power factor range bounds the actual design basis inductive loading the DG would experience. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This Surveillance is modified by a Note which states that momentary transients (e.g., due to changing bus loads) do not invalidate this test.

SR 3.8.1.15

This Surveillance demonstrates that the diesel engine can restart from a hot condition, such as subsequent to shutdown from normal Surveillances, and achieve the required voltage and frequency within 10 seconds. The 10 second time is derived from the requirements of the accident analysis to respond to a design basis large break LOCA. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

INSERT 6

Start new paragraph

This SR is modified by two Notes. Note 1 ensures that the test is performed with the diesel sufficiently hot. The load band is provided to avoid routine overloading of the DG. Routine overloads may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY. The requirement that the diesel has operated for at least 2 hours at full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. Alternatively, the DG can be operated until operating temperatures have stabilized. Note 2 states that momentary transients (e.g., due to changing bus loads) do not invalidate this test.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.16

As required by Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.11, this Surveillance ensures that the manual synchronization and load transfer from the DG to the offsite source can be made and the DG can be returned to ready to load status when offsite power is restored. It also ensures that the autostart logic is reset to allow the DG to reload if a subsequent loss of offsite power occurs. The DG is considered to be in ready to load status when the DG is at rated speed and voltage, the output breaker is open and can receive an autoclose signal on bus undervoltage, and the load sequence timers are reset.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.17

Demonstration of the test mode override ensures that the DG availability under accident conditions will not be compromised as the result of testing and the DG will automatically reset to ready to load operation if a LOCA actuation signal is received during operation in the test mode. Ready to load operation is defined as the DG running at rated speed and voltage with the DG output breaker open. These provisions for automatic switchover are required by IEEE-308 (Ref. 10), paragraph 6.2.6(2).

The intent in the requirement associated with SR 3.8.1.17.b is to show that the emergency loading was not affected by the DG operation in test mode. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the emergency loads to perform these functions is acceptable.

This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.18

Under accident and loss of offsite power conditions, loads are sequentially connected to the bus by the automatic load sequence timers. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The 10% load sequence time interval tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of ESF buses.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.19

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.11, during a loss of offsite power actuation test signal in conjunction with an ESF actuation signal. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

INSERT 7 →

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note. The reason for the Note is that the performance of the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.20

This Surveillance demonstrates that the DG starting independence has not been compromised. Also, this Surveillance demonstrates that each engine can achieve proper speed within the specified time when the DGs are started simultaneously.

INSERT 8 →

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. UFSAR, Chapter 8.
3. Regulatory Guide 1.9, Rev. 3, July 1993.
4. UFSAR, Chapter 6.
5. UFSAR, Chapter 15.
6. Regulatory Guide 1.93, Rev. 0, December 1974.
7. R. M. Krich to NRC Document Control Desk Letter, "Request for Amendment to Technical Specifications, to Facility Operating Licenses, Emergency Diesel Generators, Completion Time Extension and Surveillance Requirement Change," January 20, 2000.
8. Generic Letter 84-15, "Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability," July 2, 1984.
9. 10 CFR 50, Appendix A, GDC 18.
10. IEEE Standard 308-1978.
11. Regulatory Guide 1.137, Rev. 1, October 1979.
~~12~~. EC 622685, Rev 0.

INSERT 9 →

13 →

BRAIDWOOD & BYRON BASES INSERTS

INSERT 1: SR 3.8.1.7 is consistent with the guidance for this SR contained in Section 2.2.3, "Fast Start Test," of Regulatory Guide 1.9 (Ref. 3), which requires verification that the DG "reaches required voltage and frequency within acceptable limits and time as defined in the plant technical specifications."

INSERT 2: The criteria that in ≤ 10 seconds the DG achieves ≥ 3950 V and ≥ 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria for the DG that are specified to confirm the capability of the DG to recover from a loading transient.

SR 3.8.1.2 and SR 3.8.1.7 also demonstrate that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor on the following:

- Pump flow and developed head to meet design bases requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 3: This Surveillance may be accomplished by:

a. Tripping the DG output breaker with the DG carrying greater than or equal to its associated single largest post-accident load while paralleled to offsite power, or while solely supplying the bus, or

b. Tripping its associated single largest post-accident load with the DG solely supplying the bus.

INSERT 4: SR 3.8.1.11 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 5: The criteria that in ≤ 10 seconds the DG achieves ≥ 3950 V and ≥ 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria from the DG that are specified to confirm the capability of the DG to recover from a loading transient.

SR 3.8.1.12 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 6: The criteria that in ≤ 10 seconds the DG achieves ≥ 3950 V and ≥ 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria from the DG that are specified to confirm the capability of the DG to recover from a loading transient.

SR 3.8.1.15 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 7: SR 3.8.1.19 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 8:

The criteria that in ≤ 10 seconds the DG achieves ≥ 3950 V and ≥ 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria from the DG that are specified to confirm the capability of the DG to recover from a loading transient.

SR 3.8.1.20 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Ref. 12) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and

INSERT 9:

12. WCAP-17308-NP-A, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances."