Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-16-001

May 26, 2016

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Sequoyah Nuclear Plant Units 1 and 2
Renewed Facility Operating License Nos. DPR-77 and DPR-79
NRC Docket Nos. 50-327 and 50-328

Subject: **Application to Modify Sequoyah Nuclear Plant, Units 1 and 2 Technical Specifications Regarding Diesel Generator Steady State Frequency (SQN-TS-14-02)**

In accordance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.90, "Application for amendment of license, construction permit, or early site permit," Tennessee Valley Authority (TVA) is submitting a request for an amendment (SQN-TS-14-02) to Renewed Facility Operating License Nos. DPR-77 and DPR-79 for the Sequoyah Nuclear Plant (SQN) Units 1 and 2.

This license amendment request proposes to amend the SQN Units 1 and 2 Technical Specifications (TS) by modifying the acceptance criteria for the diesel generator (DG) steady state frequency range provided in TS Surveillance Requirements (SRs) 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18. Currently, the acceptance criteria are ≥ 58.8 Hz and ≤ 61.2 Hz. TVA proposes to change the SQN DG steady state frequency acceptance criteria to ≥ 59.8 Hz and ≤ 60.2 Hz. The DG TS SR steady state voltage range of ≥ 6800 V and ≤ 7260 V is unaffected.

TVA has determined that the steady state frequency range acceptance criteria currently specified by SQN TS SRs 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18 are non-conservative. A Condition Report (CR) was initiated in accordance with the TVA Corrective Action Program. Subsequently, a prompt determination of operability (PDO), including administrative controls were established in accordance with the Nuclear Regulatory Commission (NRC) Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety," dated December 29, 1998. As a result of the CR, a number of immediate/interim and other corrective actions were identified, implemented, and completed. A review of historical DG test records for frequency and voltage supported the fact that the DGs were operable and supported the existing design basis analyses accidents. Administrative controls for DG frequency have been implemented in the applicable Surveillance Instructions to support continued DG operability.

The enclosure to this letter provides a description of the proposed changes, technical evaluation of the proposed changes, regulatory evaluation, and a discussion of environmental considerations. Attachments 1 and 2 to the enclosure provide the existing TS and Bases pages marked-up to show the proposed changes. Attachments 3 and 4 to the enclosure provide the existing TS and Bases pages retyped to show the proposed changes. Changes to the existing TS Bases, are provided for information only and will be implemented under the Technical Specification Bases Control Program.

As noted in the enclosure, the modified SR 3.8.1.9 is normally performed during outages. Therefore, TVA requests NRC approval of this proposed license amendment by May 2017 with implementation during or after the next refueling outage on SQN Unit 2 (scheduled to be completed in May 2017). This will allow all four DGs to be tested via the new test methodology to satisfy the revised SR 3.8.1.9 prior to implementation of this proposed license amendment.

TVA has determined that there are no significant hazard considerations associated with the proposed change and that the change qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9).

The SQN Plant Operations Review Committee and the TVA Nuclear Safety Review Board have reviewed this proposed change and determined that operation of SQN Units 1 and 2 in accordance with the proposed change will not endanger the health and safety of the public.

In accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and the enclosure to the Tennessee Department of Environment and Conservation.

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this request to Ed Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 26th day of May 2016.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosure

cc: See Page 3

RDW: EDS
Enclosure: Evaluation of Proposed Change

cc (Enclosure):

NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Sequoyah Nuclear Plant
NRR Project Manager – Sequoyah Nuclear Plant
Director, Division of Radiological Health – Tennessee State Department of Environment and Conservation

ENCLOSURE

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2

EVALUATION OF PROPOSED CHANGE

Subject: **Application to Modify Sequoyah Nuclear Plant Units 1 and 2 Technical Specifications Regarding Diesel Generator Steady State Frequency (SQN-TS-14-02)**

1.0 SUMMARY DESCRIPTION

The Tennessee Valley Authority (TVA) is requesting a license amendment to amend the Sequoyah Nuclear Plant (SQN) Units 1 and 2 Technical Specifications (TS) by modifying the acceptance criteria for the diesel generator (DG) steady state frequency range provided in SQN Units 1 and 2, TS 3.8.1, "AC Sources - Operating." Specifically, the proposed change and supporting evaluation will modify the acceptance criteria for the DG steady state frequency range provided in SQN Units 1 and 2 TS Surveillance Requirements (SRs) 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18. Currently, the DG SR steady state acceptance criteria are ≥ 58.8 Hz and ≤ 61.2 Hz. TVA proposes to change the SQN DG steady state frequency acceptance criteria to ≥ 59.8 Hz and ≤ 60.2 Hz. The DG TS SR steady state voltage range of ≥ 6800 V and ≤ 7260 V is not affected. This license amendment request (LAR) is similar to a Watts Bar Nuclear Plant (WBN) Unit 1 submittal (Reference 1), which was approved by the NRC in Reference 2.

This proposed change also affects SR 3.8.1.3, because it requires successful performance of SR 3.8.1.2 or 3.8.1.7. TS 3.8.2, "AC Sources - Shutdown," is also affected because SR 3.8.2.1 requires the applicable SRs of TS 3.8.1 to be performed. However, no specific changes to SR 3.8.1.3 or TS 3.8.2 are required.

2.0 DETAILED DESCRIPTION

2.1 Proposed Changes

Currently, the acceptance criteria for DG steady state frequency specified in SQN Units 1 and 2, TS SRs 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18 are ≥ 58.8 Hz and ≤ 61.2 Hz. TVA proposes to conservatively narrow the DG frequency range by increasing the current DG frequency lower limit of ≥ 58.8 Hz to ≥ 59.8 Hz and decreasing the current upper limit from the existing ≤ 61.2 Hz to ≤ 60.2 Hz in the SQN Units 1 and 2 TS[1] (i.e., SRs 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18) and TS Bases 3.8.1. The proposed SQN Units 1 and 2 DG frequency and voltage steady state operating ranges only apply to the steady state condition of DG operation, and are summarized below in Table 1.

Table 1
Technical Specification DG Steady-State Operating Range

Parameter	Range
Frequency	≥ 59.8 Hz to ≤ 60.2 Hz
Voltage	≥ 6800 V to ≤ 7260 V

This change is applicable to the surveillances performed at 31 days, 18 months, and ten years when maintenance & test equipment (M&TE) is installed on the DG per the surveillance instructions.

[1] Note: No change is required to SQN Units 1 and 2, TS SR 3.8.1.19 because that surveillance does not apply to steady state operation.

The DG voltage limits as described in the Technical Specifications are correct and do not require revision.

Attachments 1 and 2 to this enclosure provide the existing SQN Units 1 and 2 TS and Bases pages marked-up to show the proposed changes. Attachments 3 and 4 to this enclosure provide the clean typed TS and Bases pages with the proposed changes incorporated.

The proposed Bases changes are provided to the NRC for information only.

2.2 Need for Proposed Changes

Plant safety analyses make specific assumptions regarding the emergency core cooling system (ECCS) flow to provide the core cooling function following any event that requires safety injection (SI) to mitigate the event. For the events that assume a loss of offsite power (LOOP), the DGs provide power to the ECCS pumps. Following a LOOP, each DG starts and ties to an engineered safety feature (ESF) board, and essential loads, including the ECCS pumps, are sequentially connected to the ESF board by individual timers for each load sequence. The calculated ECCS flow rates assume that the steady state DG frequency is 60 Hz (i.e., after the DG starting and loading transients).

Once the DG starting and loading sequences are complete, the DG governor maintains the frequency at 60 Hz within a specified tolerance, which is based on the governor manufacturer/model.

The ECCS flow provided by the ECCS pumps is affected by the pump speed, which in turn is a function of the DG frequency. Historically, the DG frequency tolerances associated with the governor were not considered in the development of the ECCS, containment spray system (CSS), and auxiliary feedwater (AFW) flow rates. The primary effect of changes in DG frequency on the ECCS safety functions is an increase or decrease in the speed of safety-related motors that are powered by the DG. The increase or decrease in the speed of the motors affects pump performance, motor operated valve (MOV) stroke times, cooling fan performance, and DG loading, among other factors.

The minimum and maximum frequency values of 58.8 Hz and 61.2 Hz in the SQN TS SRs are equal to ± 2% of the 60 Hz nominal frequency (i.e., the TS specified plant specific transient range). However, the ± 2% frequency tolerance is only applicable to DG starting and loading transients, and does not apply to steady state operation as discussed in Regulatory Guide 1.9, Revision 0, "Selection of Diesel Generator Set Capacity for Standby Power Supplies" (Reference 3).

Because the safety analyses did not consider the effects of operating at the extremes of the steady state frequency range specified in TS SRs 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18, TVA has determined that the current SQN Units 1 and 2 TS SR acceptance criteria for steady state DG frequency are non-conservative. The non-conservative acceptance criteria were addressed within the TVA corrective action program (CAP) and administrative controls were established in accordance with NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety" (Reference 4). To address the non-conservative TS,

TVA is proposing a change to TS SRs 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18 to revise the DG SR steady state acceptance criteria to ≥ 59.8 Hz and ≤ 60.2 Hz.

The four SQN DGs are shared between SQN Units 1 and 2, as described in Section 3.1, and the SRs for all four DGs are specified in the SQN Units 1 and 2 TSs. Therefore, the proposed SR steady state frequency acceptance criteria of ≥ 59.8 Hz and ≤ 60.2 Hz would apply to all four DGs.

2.3 Implementation

The TVA process governing the preparation and submittal of TS changes and LARs requires that the appropriate organizations (e.g., Operations, Training, Engineering, Maintenance, Chemistry, Radiation Protection, and Work Control) identify the documents that are affected by each proposed change to the TSs and Operating Licenses. Among the items that are considered are training, plant modifications, procedures, special implementation constraints, design documents, and surveillance instructions associated with TS SRs, Technical Requirements Manual, TS Bases, and the Updated Final Safety Analysis Report (UFSAR). The process requires that procedures and design document changes necessary to support TS Operability are approved prior to implementation of an NRC approved license amendment. The process also provides assurance that the remaining changes, if any, are scheduled and tracked for configuration control.

SR 3.8.1.9 requires verification that each DG can maintain acceptable frequency following a load rejection greater than or equal to the single largest post-accident load. This SR includes verification that the DG can restore frequency within the allowable steady-state band within three seconds. SQN currently performs SR 3.8.1.9 concurrent with SR 3.8.1.10, which verifies that the DG can withstand a full load rejection (from a fully loaded condition). This approach is acceptable because the full load rejection of SR 3.8.1.10 as well as the “single largest post-accident load” requirement of SR 3.8.1.9 are performed. The current test methodology for both SR 3.8.1.9 and 3.8.1.10 requires the DG to initially be in parallel with offsite power to achieve the required power value.

When the DG is operating in parallel with offsite power for surveillance testing, the speed droop circuit in the DG speed governor is required to be in service (i.e., non-emergency / droop test mode). The speed droop function is necessary to ensure stable and controllable load-sharing between the DG and offsite power. However, the speed droop results in a steady-state frequency greater than the nominal 60 Hz value following a load rejection. Historical data shows that DG frequency typically stabilizes at approximately 60.3 Hz following a single largest load rejection with speed droop in service. This final frequency value is acceptable under the current SR 3.8.1.9, but is outside the more stringent frequency criteria proposed in this LAR. These results are due to the surveillance test methodology (i.e., performing the load rejection with the speed droop circuit in service) rather than being an indication of a problem or malfunction in the DG speed governor.

To successfully perform SR 3.8.1.9 with the more conservative frequency band proposed in this LAR, the test methodology must be modified to perform the load rejection with the DG in accident mode (emergency / isochronous mode) and isolated on the shutdown board (i.e., not initially in parallel with offsite power). In the accident mode, the DG speed governor uses a fixed speed reference corresponding to 60.0 Hz, which ensures that the frequency criteria of SR 3.8.1.9 can be met. This requires a revision to the surveillance test procedures to perform SR 3.8.1.9 in conjunction with SR 3.8.1.18 (shutdown board blackout testing). This change in methodology is beneficial because it more closely replicates the conditions under which the DGs may have to perform following a loss of offsite power. TVA has initiated action to ensure that the applicable surveillance testing procedures are revised to incorporate this change prior to the next unit refueling outage on each SQN unit. Because the modified SR 3.8.1.9 is normally performed during outages, TVA is requesting implementation of this proposed license amendment during or after the next refueling outage on SQN Unit 2 (scheduled to be completed in May 2017). This will allow all four DGs to be tested via the new test methodology to satisfy revised SR 3.8.1.9 prior to implementation of this proposed license amendment.

3.0 TECHNICAL EVALUATION

3.1 System Description

The onsite Class 1E alternating current (AC) standby system is described in SQN UFSAR Section 8.3, "Onsite Power System."

As noted in SQN UFSAR Section 8.3, the onsite AC power system is a Class 1E system, which consists of the standby AC power system and the 120 V vital AC system. The standby AC power system is a safety-related system, which supplies power for energizing all AC-powered electrical devices essential to safety. The safety function of the standby AC power system is to supply power to permit functioning of components and systems required to assure that: (1) fuel design limits and reactor coolant pressure boundary design conditions are not exceeded due to anticipated operational occurrences, and (2) the core is cooled and vital functions are maintained in the event of a postulated accident, subject to loss of the preferred power system and subject to any single failure in the standby power system.

Specifically, the standby AC power system includes:

- four Class 1E DGs (designated 1A-A, 1B-B, 2A-A, and 2B-B)
- four 6.9 kV shutdown boards and logic relay panels
- associated 6.9 kV/480 V transformers and 480 V shutdown boards
- motor control centers supplied by the 480 V shutdown boards

The AC standby power system is divided into two redundant load groups (power trains). The 6.9 kV shutdown boards are arranged electrically into two power trains with two boards associated with each train and each unit. The boards comprising train A are located in the SQN Unit 1 side and those of train B are located in the SQN Unit 2 side. The train A boards are separated from the train B boards by a reinforced concrete block wall, which is a qualified fire barrier, extended to the ceiling. When the preferred (offsite) power system is not available, each shutdown board is energized from a separate standby DG.

A loss of voltage on the 6.9 kV shutdown board starts the associated DG and initiates logic that trips the supply feeder breakers, all 6.9 kV loads (except the 480 V shutdown board transformers), and the major 480 V loads. The bypass breaker for the 480 V shutdown board's current-limiting inductive reactor is also closed as part of this logic. When the DG has reached rated speed and voltage, the generator is automatically connected to the 6.9 kV shutdown board. This return of voltage to the 6.9 kV shutdown board initiates logic that connects the required loads in sequence. The standby (onsite) power system's automatic sequencing logic is designed to automatically connect the required loads in proper sequence should the logic receive an accident signal prior to, concurrent with, or following a loss of all nuclear unit and preferred (offsite) power.

As noted in UFSAR Section 8.3.1.1, there are two loading sequences:

> "One, which is applied in the absence of a safety injection signal (SIS), the 'non-accident condition,' and the other 'accident condition,' applied when an SIS (and containment spray actuation signal) is received coincident with a sustained loss of voltage on the 6.9 kV shutdown board."

A loss of offsite power coincident with an SIS is the design basis event; however, as noted in UFSAR Section 8.3.1.1, an SIS received during the course of a non-accident shutdown loading sequence would cause the actions described below.

1. "Loads already sequentially connected that are not required for an accident will be disconnected (except fire pumps powered by the DG).

2. Loads already sequentially connected that are required for an accident will remain connected.

3. Loads pending sequential loading that are not required for an accident will not be connected.

4. Loads awaiting sequential loading that are required for an accident will have their sequential timers reset to time zero from which they will then be sequentially loaded."

An SIS received in the absence of a sustained loss of voltage on a 6.9 kV shutdown board would start the DGs, but would not connect them to the shutdown boards.

Each DG consists of two 16-cylinder engines directly connected to a 6.9 kV generator. The continuous rating of each DG is 4400 kilowatt (kW) at 0.8 power factor, 6.9 kV, 3-phase, and 60 Hz. Each DG also has an additional rating of 4840 kW for 2 hours out of 24 hours.

Ratings for the DGs satisfy the requirements of Regulatory Guide 1.9 as clarified in Section 4.1. The continuous service rating of each DG is 4400 kW with 10% overload permissible for up to 2 hours in any 24 hour period.

The normal operating speed of the DGs is 900 rpm. The DGs use a tandem arrangement; that is, each DG consists of two diesel engines with a generator between them connected together to form a common shaft. The DGs are physically separated, electrically isolated from each other, and protected from the probable maximum flood.

The DGs are equipped with Woodward governors and consist of:

- an EGB-13P actuator on each engine
- a 2301A computer (reverse biased)
- a magnetic speed pickup

The Woodward EGB-13P actuator used with the 2301A computer is a proportional governor that moves the fuel rack in inverse proportion to the voltage signal from the computer. There is a governor actuator on each DG engine and they are electrically connected in series so that the loss of signal to one actuator would also result in the loss of signal to the other actuator. Based upon the input from the magnetic speed pickup, the electronic governor sends electric signals to the actuators on the two DG engines. This signal goes to the coils of each actuator that are connected in series so that each coil receives the same electric signal. The terminal shaft of each actuator will move the same amount for each change in signal, thus the fuel control shaft movement on each DG engine will be identical.

The steady state speed control will be within 0.25 percent of rated speed. The governor design includes circuits to provide high- and low-limit adjustments. These limits set the maximum and minimum speed that can be set by varying the speed-setting milliamp or voltage reference. The low limit can be set as high as rated speed, if desired, eliminating the ability of the process or controller speed setting to reduce speed. The SQN Units 1 and 2 DG electrical governor is set within a speed band that is equivalent to a DG frequency of 59.95 Hz ± 0.05 Hz.

The SQN Units 1 and 2 DG voltage and frequency regulators were evaluated to ensure they were capable of meeting the TS and associated SRs. The measured values for both voltage and frequency have not exhibited drift and have been consistently within the respective setting band.

The SQN Units 1 and 2 DG voltage regulators and speed regulators are independent devices that are not expected to exhibit drift. This has been demonstrated by the past history of diesel surveillances in which the diesel is operated in isochronous mode. If the two variables drift in different directions (e.g., frequency lower and voltage higher), the combined effect on pump speed would be less than an individual drift.

Based on this independence and stability, the composite impact of frequency and voltage were evaluated independently for the Technical Specification band. The frequency range was analyzed over the full range (i.e., 59.8 Hz to 60.2 Hz) within the voltage setting range (i.e., 6925 V to 7000 V). Likewise, the voltage (i.e., 6800 V to 7260 V) was analyzed over the full range within the frequency range of 59.8 Hz to 60.2 Hz.

Test equipment verifies that the governor controls the DG frequency within the steady-state operational band of ≥ 59.8 Hz to ≤ 60.2 Hz.

The DGs, as clarified in Section 4.1, satisfy the requirements of Regulatory Guide (RG) 1.9, Revision 0 (Reference 3) and RG 1.9, Revision 1 (Reference 5).

3.2 Evaluation

3.2.1 Introduction

Calculations were conducted to determine the effects of the DG frequency variation between 59.8 Hz and 60.2 Hz on plant equipment fed by the DGs following a loss of offsite power (LOOP) or a loss of coolant accident (LOCA) coincident with a LOOP.

The changes in the DG frequency have the direct effect of changing motor speeds for the motors fed from the generators following a LOOP or a LOOP/LOCA. The changes in motor speeds are addressed in Section 3.2.2 and affect the following components:

- Pumps and Fans (Section 3.2.3)
- Air compressors and chillers (Section 3.2.4)
- Motor operated valves (MOVs) (Section 3.2.5)
- Electrical Equipment (Section 3.2.6)

The changes in these parameters were evaluated to demonstrate that the subject equipment would continue to meet their safety related functions within the analyzed bounds documented in design documents. In addition, the increased horsepower associated with increased frequency was evaluated to ensure that the horsepower increases do not result in exceeding the sustained load ratings for the DGs and the decreased flowrate associated with the revised frequency range was evaluated to ensure pump parameters are adequate. Battery chargers and power transformers do not have motors, but frequency changes were examined to determine if the chargers and transformers would provide acceptable output parameters to continue to meet the specifications and requirements of the downstream components.

The results of these calculations are provided below.

3.2.2 Comparison of Voltage and Frequency Impact

Motor speed change, as a function of torque (Reference 6), is:

$\Delta S = (T/T_N - 1)(S_{syn} - S)$

where,
ΔS = speed change
S_{syn} = motor synch speed
S = motor speed
T = original torque
T_N = the new torque

The motor speed is directly affected by the frequency. The affected components, listed in Section 3.2.1, are either designed for 6600 V operation with the supply boards rated at 6900 V, or designed for 460 V operation with the supply boards rated

at 480 V. Therefore, during normal operation, the motors see a voltage higher than their nominal rating. Thus, for the lower voltage limit of 6800 V (473 V on the low voltage side), the motors still have their minimum voltage and produce their design torque. Therefore, a low voltage condition is a non-bounding condition and was not further evaluated. For the high voltage case, the motors could have a voltage of 7260 V (505 V on the low voltage side) or 10 percent above the motor design nominal rating, neglecting any voltage drop from the DG to the motor.

Because the torque developed by a motor is directly proportional to the square of the terminal voltage, the above equation is rewritten in terms of voltage, as follows:

$\Delta S = [(V/V_N)^2 - 1]*(S_{syn} - S)$

where,
ΔS = speed change
$(S_{syn} - S)$ = motor slip, < 2 percent (the value of 2 percent is based on a review of vendor manuals which demonstrates that the motors have < 2 percent slip)
V = Nominal voltage, 6600 V
V_N = New voltage, 7260 V

$\Delta S = [(6600/7260)^2 - 1]*(2 \text{ percent})$

$\Delta S = -0.35$ percent

Thus, with a motor slip of less than 2 percent, the motor speed impact is less than 0.35 percent due to the voltage increase to 7260 V from design voltage of 6600 V.

The frequency shift could result in a $\pm$ 0.35 percent motor speed and the voltage could result in +0.35 percent motor speed change. Therefore, a speed impact of $\pm$ 0.35 percent was used as the DG frequency impact for analyzing the effect caused either by frequency or voltage variation on the affected components in the following sections.

3.2.3 Effect on Pumps

3.2.3.1 Pump Net Positive Suction Head (NPSH)

The change in the DG frequency was evaluated for the effect on the NPSH available to the following emergency core cooling system (ECCS) pumps. These pumps are fed from the DGs; therefore, they could be affected by the variation in frequency of 59.8 Hz to 60.2 Hz:

- Containment spray (CS)
- Safety injection (SI)
- Residual heat removal (RHR)
- Centrifugal charging (CC)

An evaluation was performed to determine if the NPSH available (NPSHA) exceeds the NPSH required (NPSHR) for the RHR and the CS pumps while taking suction from the containment sump (recirculation mode). The evaluation also determined

the NPSH Margin for the CS, SI, RHR, and CC pumps during injection mode operation with suction taken from the refueling water storage tank (RWST). Only the injection mode is presented, as the injection mode has less NPSH margin than the recirculation mode.

3.2.3.1.1 Pump Flow Rates

DG frequency affects both the head and flow values based on the pump affinity laws as follows:

$Q_2 = (N_2/N_1)*Q_1$

where,
Q_2 = Changed pump flow due to DG frequency variation
Q_1 = Nominal pump flow
N_2 = Changed pump speed due to DG frequency variation
N_1 = Nominal pump speed

For the 59.8 Hz frequency,

$Q_2 = (59.8/60.0)*Q_1 = 0.997*Q_1$

For the 60.2 Hz frequency,

$Q_2 = (60.2/60.0)*Q_1 = 1.003*Q_1$

Therefore, a 0.2Hz change in DG frequency will change pump flow by $\pm$ 0.33%.

3.2.3.1.2 NPSH

The NPSHR for pumps increases as the speed and flowrate increase. The NPSHR is also affected by the increase in DG frequency as follows:

$$NPSHR_2 = \frac{(N_2\sqrt{Q_2})^{4/3}}{(N_1\sqrt{Q_1})^{4/3}} * NPSHR_1$$

Table 2 presents examples of NPSHR changes resulting from the DG frequency changes for the various pumps.

The results in Table 3 demonstrate the actual flow rates, NPSHA, NPSHR, and the NPSH Margin for the various pumps. The NPSHR values were obtained from the pump manufacturer's NPSH curves at the flow values that are listed in Table 3. The DG increased frequency effects are included in these values. The results demonstrate that there is adequate positive margin for the pumps with the DG operating at the proposed revised frequencies.

Table 2
Example NPSHR Changes

System	CS	CC	SI	RHR
NPSHR (ft) current	12.5	22	37.5	16
NPSHR (ft) at 60.2 Hz	12.6	22.1	37.8	16.1

Table 3
NPSH Margin While Operating in RWST Injection Mode with Revised DG Frequency

System	CS		CC		SI		RHR	
Pump Number	A-A	B-B	A-A	B-B	A-A	B-B	A-A	B-B
Increased Pump Flow (sgpm)	5100	5100	450	450	500	500	4200	4200
Pump Suction P (psig)	3.8	-2.5	6.7	6.8	1.9	1.6	-1.6	-3.9
Pump Suction P (psia)	18.2	11.9	21.1	21.2	16.3	16.0	12.8	10.5
Vapor P at 105°F (psia)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
NPSHA (psi)	17.1	10.8	20	20.1	15.2	14.9	11.7	9.4
NPSHA (ft)	39.7	25.1	46.5	46.7	35.3	34.6	27.2	21.8
NPSHR (ft)	12.1	12.1	18	18	19	19	15	15
NPSH margin (ft)	27.6	13	28.5	28.7	16.3	15.6	12.2	6.8

3.2.3.2 Pump Test Points

The DG frequency variation of 59.8 Hz to 60.2 Hz has a negligible effect on plant operations for the above affected pumps based on the revised flow rates in Section 3.2.3.1. The flow change resulting from the DG frequency variation is limited to $\pm$ 0.35%. The pump test acceptance criteria upper limit will be adjusted downward, and the lower limit will be adjusted upward in order to encompass the potential flow variation. The ASME OM Code inservice pump testing acceptance criteria provide assurance that the design basis is met.

3.2.3.3 Effect on Fans

DG frequencies above/below 60 Hz directly increase/reduce motor speeds for fans. Fan speed is directly proportional to fan flow. Therefore, increased/reduced motor speed will result in increased/reduced flows. For the 60.2 Hz DG frequency, fan flows are impacted as follows:

$Q_2 = (60.2/60.0)*Q_1 = 1.0033*Q_1$

and for the 59.8 Hz DG frequency, fan flows are impacted as follows;

$Q_2 = (59.8/60.0)*Q_1 = 0.9967*Q_1$

where:
Q_2 = Changed fan flow due to DG frequency variation
Q_1 = Nominal fan flow

From the above equations, fan flow could vary from nominal to about $\pm$0.33%. From the G-Spec (Reference 7), total airflow of a system can vary by $\pm$10% at the system fan. Thus, fan flows are within allowed tolerances due to sustained DG frequency variations.

3.2.3.4 Effect on Horsepower Requirements

Horsepower requirements for a pump motor and fan increase by the cube of the speed change. Therefore, increased motor speed will result in increased horsepower demands on the diesels that feed the subject loads. The potential increase in load on the DGs due to operating frequency and voltage was evaluated to 60.2 Hz and 7260 V. The highest steady state loading was used which envelopes the other steady state loading scenarios.

Motor slip is defined as the difference between actual speed and synchronous speed an induction machine operates at as a percentage of the synchronous speed. A motor slip of about one percent increase in speed was calculated based on the increased DG voltage.

Motor speed varies directly with the system frequency as shown below:

$\omega^1/\omega^2 = f^1/f^2$

Thus, the speed impact of the frequency variation is (60 $\pm$ 0.2)/60 or $\pm$ 0.33%.

Therefore, the total impact of the voltage and frequency shift would be the sum of 1% + 0.33% which equals a 1.33% increase in motor speed.

As noted above, motor horsepower varies directly with the cube of the motor speed:

$Load_{New} = Load_{old} * \Delta Speed^3$

$Load_{New} = Load_{Old} * 1.0133^3 = Load_{Old} * 1.040$

Therefore, DG load would be increased by 4% if both the voltage and frequency were at their upper limits of 7260 V and 60.2 Hz. Because the DG fuel oil consumption is analyzed for a fully loaded diesel, the voltage and frequency variation do not adversely affect the fuel oil analysis.

3.2.4 Effect on Air Compressors and Chillers

Air compressors and chillers are intermittently operated equipment designed to maintain an asset or volume between selected setpoints. Air compressors cycle on to charge a system to a high pressure setpoint, and then cycle off until the header pressure drops below the specified setpoint. Chillers cycle on and off to maintain a refrigerant fluid temperature between a specified range of temperatures. Because both air compressors and chillers work intermittently to maintain a fluid media in a range between two setpoints, the approximate $\pm$0.33% ($\pm$0.2 Hz) variation in DG frequency has a negligible effect on this type of equipment.

3.2.5 Effect on MOVs

The affected MOVs were evaluated for frequency and voltage related to DG loading. Motor torque and stroke time are two important parameters associated with MOV performance. The DG frequency affects the motor torque (Section 3.2.2) and speed. Valve stroke time is inversely proportional to motor speed. Therefore, faster/slower motor speed would result in shorter/longer valve stroke times. For the 60.2 Hz frequency, valve stroke times vary as follows:

$T_2 = (60.2/60.0)*T_1 = 1.0033*T_1$ Equation (1)

and for the 59.8 to 60.0 Hz DG frequency range, valve stroke times are affected as follows;

$T_2 = (59.8/60.0)*T_1 = 0.9967*T_1$ Equation (2)

where:
T_2 = Changed stroke time due to DG frequency variation
T_1 = Nominal stroke time

From equations (1) and (2), valve stroke times vary from nominal to approximately $\pm$0.33%. For example, a valve that strokes in 30 seconds has the potential variation in stroke time of approximately $\pm$0.1 seconds. This potential variation is small in comparison to the valve stroke times documented in the inservice testing program and is essentially the same as the recorded resolution of the stop watches used for valve stroke time testing (i.e., 0.1 seconds). The majority of the active safety related MOVs stroke in 10 seconds or less; therefore, the variance in stroke time is $\pm$ 0.03 seconds. For a 10-second valve, this is below the detectible threshold of the normal timing method. The longest of the safety related valve stroke times is up to 120 seconds for the valves involved in the automatic containment sump swap over. The time variation is about $\pm$ 0.4 seconds for these valves.

The MOV stroke time acceptance criteria for the ASME OM Code testing are adjusted to include the potential low frequency power. Accordingly, the design basis requirements for valve stroke time will be met. The minimum allowable DG voltage provides a voltage that is greater than the voltage used for the Generic Letter 89-10 analysis.

Furthermore, based on the analyses in Section 3.2.2, the impact to torque is acceptable. In addition, there would not be a concern for water hammer due to the small change in stroke time. Therefore, there are no concerns with MOV operation due to the variation in DG frequency and voltage.

3.2.6 Effect on Electrical Equipment

Most static loads are insensitive to changes in frequency and have a directly proportional change in current with terminal voltage, which is the opposite of the effects of voltage variation on induction motors. Only electronically controlled equipment, such as battery chargers, inverters and uninterruptible power supplies may be of concern at off nominal line frequency. The maximum allowable board voltage is 7260 V and the degraded voltage relay safety limit dropout setting is 6400 V. The variation in voltage from the DG of 6800 to 7260 V is much less than the range expected from the offsite source. Therefore, the variation in DG output voltage is bounded by voltage variations when off site power supplies the AC auxiliary power system.

3.2.6.1 Battery Chargers

The battery charger regulation is maintained at ±1% from no-load to full load with simultaneous changes in AC line voltage of +10% / -15% and changes in AC line frequency of ±5%. Therefore, the variations in DG frequency will not impact the performance of the battery chargers.

3.2.6.2 Hydrogen Igniters

The hydrogen mitigation system (i.e., H_2 igniters) does not use frequency sensitive components with the exception of the regulating transformer. The output is regulated to ±1% from no-load to full load with AC line voltage changes of ±10% and changes in AC frequency changes of ±5%. Therefore, the variations in DG frequency will not impact the performance of the hydrogen mitigation system.

3.2.6.3 Instrumentation

120 V AC instrumentation circuits are designed with a ±1% variation in frequency. The variation in DG frequency is within this range.

3.3 Conclusion

The results of these calculations determined that the proposed change in the DG frequency does not adversely affect the equipment powered by the DGs and their associated components described above. The calculations are available for NRC review. The DG output voltage and frequency range of 6800 to 7260 V and 59.8 to 60.2 Hz, respectively, will not affect the miscellaneous electrical equipment required to mitigate design basis events.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements and Criteria

The onsite standby ac power systems at SQN Units 1 and 2 are designed to comply with the following applicable regulations and requirements.

- Title 10 of the Code of Federal Regulations (10 CFR) Part 50 (10 CFR 50), Appendix A, General Design Criterion (GDC) 17, "Electric power systems," specifies that an onsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety.

- 10 CFR 50, Appendix A, GDC 18, "Inspection and testing of electric power systems," specifies that electric power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features.

- Regulatory Guide 1.6, Revision 0 (Reference 8), "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems," describes an acceptable degree of independence between redundant standby (onsite) power sources and between their distribution systems.

- Regulatory Guide 1.9, Revision 0 (Reference 3). As noted in SQN UFSAR Section 8.3.1.2.1, SQN Units 1 and 2 comply with Regulatory Guide 1.9, Revision 0 except that voltage and frequency recovery requirements are taken from Regulatory Guide 1.9, Revision 1. As further noted in SQN UFSAR Section 8.3.1.2.1, an exception is taken for frequency immediately following DG breaker closure. The DG breaker is designed to automatically close at about 94 percent of nominal frequency. This exception was accepted by the NRC in NUREG-1232 Volume 2 (Reference 9).

- IEEE Standard 308-1971, "Criteria for Class 1E Power Systems for Nuclear Power Generating Stations," provides criteria for the determination of Class 1E power system design features and the requirements for their testing, surveillance, and documentation.

  With the implementation of the proposed change, SQN Units 1 and 2 continues to meet the applicable regulations and requirements, subject to the previously approved exceptions.

4.2 Precedent

The NRC has previously approved changes revising the TS SR acceptance criteria for steady state DG frequency.

1. Amendment Number 102 was issued for WBN Unit 1 in the Safety Evaluation dated September 17, 2015 (Reference 2). The Amendment made changes similar to those in this proposed license amendment request in that it revised the DG SR steady state frequency from ≥ 58.8 Hz and ≤ 61.2 Hz to ≥ 59.8 Hz and ≤ 60.1 Hz.

2. Amendment Numbers 227 and 105 were issued for Beaver Valley Power Station, Units 1 and 2, respectively, in the Safety Evaluation dated February 11, 2000

(Reference 10). The Amendment corrected non-conservative TSs by clarifying the fuel oil storage volume requirements, increasing the load requirement for the single largest load rejection test, establishing criteria for maximum frequency that should not be exceeded following a load rejection, and revising the DG SR steady state frequency to ≥ 60.0 Hz and ≤ 60.6 Hz for Units 1 and 2 and ≥ 59.9 Hz and ≤ 60.3 Hz for Unit 2.

3. Amendment Number 129 was issued for the Palo Verde Nuclear Generating Station, Units 1, 2, and 3, in the Safety Evaluation dated October 4, 2000 (Reference 11). The Amendment corrected non-conservative TSs by revising the current steady-state DG voltage limits of ≥ 3740 V and ≤ 4580 V and steady state frequency limit of ≥ 59.7 Hz and ≤ 61.2 Hz to a steady state voltage of ≥4000 V and <4377.2 V, and steady state frequency of ≥ 59.7 Hz and ≤ 60.7 Hz for the affected SR, except that for SR 3.8.1.2, the lower frequency limit is ≥ 58.8 Hz instead of the ≥ 59.7 Hz.

4. Amendment Numbers 309 and 291 were issued for the Donald C. Cook Nuclear Plant, Units 1 and 2, respectively, in the Safety Evaluation dated April 30, 2009 (Reference 12). The Amendment corrected non-conservative TSs by reducing the maximum DG steady state frequency in the associated SRs from 61.2 Hz to 60.5 Hz. The Amendment also revised the minimum steady state voltage from 3740 V to 3910 V for certain TS SRs for consistency with the minimum steady state voltage specified in the acceptance criteria for other TS SRs, and reduced the criteria for maximum frequency that should not be exceeded following a load rejection.

5. Amendment Number 236 was issued for Crystal River, Unit 3 in the Safety Evaluation dated December 10, 2009 (Reference 13). The Amendment corrected non-conservative TSs by revising the DG steady state voltage to ≥4077 V and ≤ 4243 V and DG steady state frequency to ≥ 59.4 Hz and ≤ 60.6 Hz.

6. Amendment 204 was issued for the Wolf Creek Generating Station in the Safety Evaluation dated April 11, 2013 (Reference 14). The Amendment corrected non-conservative TSs by revising minimum DG steady state voltage to 3950 V and DG steady state frequency to ≥ 59.4 Hz and ≤ 60.6 Hz. The Amendment also revised the DG loading requirements to reflect the results of updated calculations.

4.3 Significant Hazards Consideration

The proposed change would modify the Sequoyah Nuclear Plant (SQN), Units 1 and 2, Technical Specification (TS) 3.8.1, "AC Sources - Operating," by revising the acceptance criteria for the diesel generator (DG) steady state frequency acceptance criteria specified in TS Surveillance Requirements (SRs) 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18. The frequency will be changed from ≥ 58.8 Hz and ≤ 61.2 Hz to ≥ 59.8 Hz and ≤ 60.2 Hz for SRs 3.8.1.2, 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15, and 3.8.1.18.

This proposed change also affects SR 3.8.1.3, because it requires successful performance of SR 3.8.1.2 or 3.8.1.7. TS 3.8.2, "AC Sources - Shutdown," is also affected because SR 3.8.2.1 requires the applicable SRs of TS 3.8.1 to be performed.

TVA has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, “Issuance of amendment,” as discussed below:

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

   Response: No

   The DGs are required to be operable in the event of a design basis accident coincident with a loss of offsite power to mitigate the consequences of the accident. The DGs are not accident initiators and therefore these changes do not involve a significant increase in the probability of an accident previously evaluated.

   The accident analyses assume that at least the boards in one load group are provided with power either from the offsite circuits or the DGs. The change proposed in this license amendment request will continue to assure that the DGs have the capacity and capability to assume their maximum design basis accident loads. The proposed change does not significantly alter how the plant would mitigate an accident previously evaluated.

   The proposed change does not adversely affect accident initiators or precursors nor alter the design assumptions, conditions, and configuration of the facility or the manner in which the plant is operated and maintained. The proposed change does not adversely affect the ability of structures, systems, and components (SSC) to perform their intended safety function to mitigate the consequences of an initiating event within the assumed acceptance limits. The proposed change does not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of any accident previously evaluated. Further, the proposed change does not increase the types and amounts of radioactive effluent that may be released offsite, nor significantly increase individual or cumulative occupational/public radiation exposure.

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

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

   Response: No.

   The proposed change does not involve a change in the plant design, system operation, or the use of the DGs. The proposed change requires the DGs to meet SR acceptance criteria that envelope the actual demand requirements for the DGs during design basis conditions. These revised acceptance criteria continue to demonstrate the capability and capacity of the DGs to perform their required functions. There are no new failure modes or mechanisms created due to testing the DGs within the proposed acceptance criteria. Testing of the DGs at the proposed acceptance criteria does not involve any modification in the

operational limits or physical design of plant systems. There are no new accident precursors generated due to the proposed test loadings.

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 amendment involve a significant reduction in a margin of safety?

Response: No.

The proposed change will continue to demonstrate that the DGs meet the TS definition of operability, that is, the proposed acceptance criteria will continue to demonstrate that the DGs will perform their safety function. The proposed testing will also continue to demonstrate the capability and capacity of the DGs to supply their required loads for mitigating a design basis accident.

The proposed change does not alter the manner in which safety limits, limiting safety system settings or limiting conditions for operation are determined. The safety analysis acceptance criteria are not affected by this change. The proposed change will not result in plant operation in a configuration outside the design basis.

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

Based on the above, TVA concludes that the proposed amendment does 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 Conclusion

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 amendment 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 amendment 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 amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets 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 amendment.

6.0 REFERENCES

1. TVA Letter to NRC, CNL-14-218, “Application to Modify Watts Bar Nuclear Plant, Unit 1 Technical Specification 3.8.1 Regarding Diesel Generator Steady State Frequency (SQN-TS-13-08),” dated April 6, 2015 (ML15117A462)

2. NRC letter to TVA, “Watts Bar Nuclear Plant, Unit 1 - Issuance of Amendment Regarding Modification To Technical Specification 3.8.1 Regarding Diesel Generator Steady State Frequency (TAC No. MF6153),” dated September 17, 2015 (ML15230A155)

3. Regulatory Guide 1.9, Revision 0, "Selection of Diesel Generator Set Capacity for Standby Power Supplies"

4. NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety," dated December 29, 1998

5. Regulatory Guide 1.9, Revision 1, "Selection, Design, and Qualification of Diesel-Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants"

6. WCAP-17308-NP, Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances, April 2012

7. G-Spec G-37 R5, Testing and Balancing of HVAC Systems During Installation, Modification, and Maintenance

8. Regulatory Guide 1.6, Revision 0, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems (Safety Guide 6)"

9. NUREG-1232, Volume 2, “Safety Evaluation Report On Tennessee Valley Authority: Sequoyah Nuclear Performance Plan,” dated May 1988

10. NRC Letter, "Beaver Valley 1 and 2 – Amendment for Revised Technical Specification Requirements for Emergency Diesel Generators (TAC Nos. MA4438 and MA4439)," dated February 11, 2000 (ML003684928)

11. NRC Letter, "Palo Verde Nuclear Generating Station, Units 1, 2, and 3 – Issuance of Amendments on Diesel Generator Steady-State Voltage and Frequency (TAC Nos. MA9214, MA9215, and MA9216)," dated October 4, 2000 (ML003758500)

12. NRC Letter, “Donald C. Cook Nuclear Plant, Units 1 and 2 – Issuance of Amendment to Renewed Facility Operating License Regarding Technical Specification Change Relating to Diesel Generator Steady-State Parameters (TAC Nos. MD8773 and MD8774),” dated April 30, 2009 (ML090630245)

13. NRC Letter, "Crystal River Unit 3 Nuclear Generating Plant – Issuance of Amendment Regarding Request to Revise the Technical Specification Surveillance Requirements for Emergency Diesel Generator Voltage and Frequency Limits (TAC No. ME0107),” dated December 10, 2009 (ML092680285)

14. NRC Letter, "Wolf Creek Generating Station – Issuance of Amendment Re: Revise Technical Specification 3.8.1, "AC Sources – Operating" (TAC No. ME7674)," dated April 11, 2013 (ML13077A147)

ATTACHMENT 1

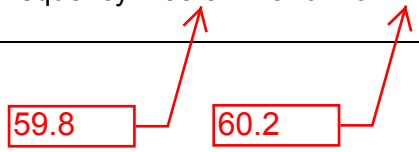
Proposed TS Changes (Mark-Ups) for SQN Units 1 and 2

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.8.1.2 ----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 2. A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. ---------- Verify each DG starts from standby conditions and achieves steady state voltage ≥ 6800 V and ≤ 7260 V, and frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 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 SR 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 ≥ 3960 kW and ≤ 4400 kW.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each engine-mounted “day” tank contains ≥ 250 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 engine-mounted “day” tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to transfer fuel oil from the storage system to the engine-mounted “day” tanks.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.7	----------NOTE---------- All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 6800 V and frequency ≥ 58.8 Hz and b. Steady state voltage ≥ 6800 V and ≤ 7260 V, and frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz.	In accordance with the Surveillance Frequency Control Program



SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.8	----------NOTES---------- 1. For the 1A, 1B, 1C, and 1D Unit Boards, this Surveillance shall not normally be performed in MODE 1 or 2. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. 2. Transfer capability is only required to be met for 6.9 kV Unit Boards that require normal and alternate power supplies. ---------- Verify automatic and manual transfer of the power supply to each 6.9 kV Unit Board from the normal supply to the alternate supply.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.9	----------NOTE---------- If performed with the 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 rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ 66.5 Hz, b. Within 3 seconds following load rejection, the voltage is ≥ 6800 V and ≤ 7260 V, and c. Within 3 seconds following load rejection, the frequency is ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. For DGs 1A-A and 1B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of shutdown boards, b. Load shedding from shutdown boards, c. DG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds, 2. Energizes auto-connected shutdown loads through load sequence timers, 3. Maintains steady state voltage ≥ 6800 V and ≤ 7260 V, 4. Maintains steady state frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz, and 5. Supplies permanently connected and auto-connected shutdown loads for ≥ 5 m	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	----------NOTES---------- 1. All DG starts may be preceded by prelube period. 2. For DGs 1A-A and 1B-B, this Surveillance shall not normally be performed in MODE 1 or 2. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and: a. In ≤ 10 seconds after auto-start and during tests, achieves voltage ≥ 6800 V and frequency ≥ 58.8 Hz, b. Achieves steady state voltage ≥ 6800 V and ≤ 7260 V and frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz, c. Operates for ≥ 5 minutes, Permanently connected loads remain energized from the offsite power system, and e. Emergency loads are energized from the offsite power system.	In accordance with the Surveillance Frequency Control Program

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 ≥ 3960 kW and ≤ 4400 kW and ≥ 2140 kvar and ≤ 2370 kvar. Momentary transients outside of load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 6800 V and frequency ≥ 58.8 Hz and b. Steady state voltage ≥ 6800 V, and ≤ 7260 V and frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	----------NOTE---------- For DG and 1E ~~nd~~ urveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- 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

SURVEILLANCE REQUIREMENTS (continued)

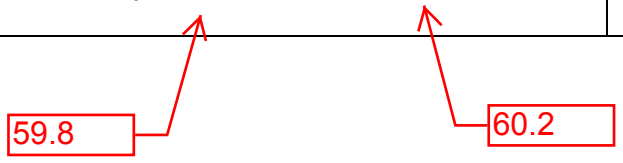
SURVEILLANCE	FREQUENCY
SR 3.8.1.18 ----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. For DGs 1A-A and 1B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- 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 shutdown boards, b. Load shedding from shutdown boards, and c. DG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds, 2. Energizes auto-connected emergency loads through load sequence timers, 3. Achieves steady state voltage ≥ 6800 V and ≤ 7260 V, 4. Achieves steady state frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz, and 5. Supplies permanently connected and auto-connected emergency loads for ≥ 60 minutes.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.2	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 2. A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. ---------- Verify each DG starts from standby conditions and achieves steady state voltage ≥ 6800 V and ≤ 7260 V, and frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 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 SR 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 ≥ 3960 kW and ≤ 4400 kW.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each engine-mounted "day" tank contains ≥ 250 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 engine-mounted "day" tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to transfer fuel oil from the storage system to the engine-mounted "day" tanks.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.7	----------NOTE---------- All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 6800 V and frequency ≥ 58.8 Hz and b. Steady state voltage ≥ 6800 V and ≤ 7260 V, and frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz.	In accordance with the Surveillance Frequency Control Program



SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.8	----------NOTES---------- 1. For the 2A, 2B, 2C, and 2D Unit Boards, this Surveillance shall not normally be performed in MODE 1 or 2. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. 2. Transfer capability is only required to be met for 6.9 kV Unit Boards that require normal and alternate power supplies. ---------- Verify automatic and manual transfer of the power supply to each 6.9 kV Unit Board from the normal supply to the alternate supply.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.9	----------NOTE---------- If performed with the 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 rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ 66.5 Hz, b. Within 3 seconds following load rejection, the voltage is ≥ 6800 V and ≤ 7260 V, and c. Within 3 seconds following load rejection, the frequency is ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz.	In accordance with the Surveillance Frequency Control Program

59.8

60.2

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. For DGs 2A-A and 2B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of shutdown boards, b. Load shedding from shutdown boards, c. DG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds, 2. Energizes auto-connected shutdown loads through load sequence timers, 3. Maintains steady state voltage ≥ 6800 V and ≤ 7260 V, 4. Maintains steady state frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz, and 5. Supplies permanently connected and auto-connected shutdown loads for ~~≥ 5~~ min	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	----------NOTES---------- 1. All DG starts may be preceded by prelube period. 2. For DGs 2A-A and 2B-B, this Surveillance shall not normally be performed in MODE 1 or 2. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and: a. In ≤ 10 seconds after auto-start and during tests, achieves voltage ≥ 6800 V and frequency ≥ 58.8 Hz, b. Achieves steady state voltage ≥ 6800 V and ≤ 7260 V and frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz, c. Operates for ≥ 5 minutes, d. Permanently connected loads remain energized from the offsite power system, and e. Emergency loads are energized from the offsite power system.	In accordance with the Surveillance Frequency Control Program

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 ≥ 3960 kW and ≤ 4400 kW and ≥ 2140 kvar and ≤ 2370 kvar. Momentary transients outside of load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 6800 V and frequency ≥ 58.8 Hz and b. Steady state voltage ≥ 6800 V, and ≤ 7260 V and frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	----------NOTE---------- For DGs ~~2A-A and 2B-B~~, this Surveillance shall normally be performed in MODE 1, 2, 3, or 4. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- 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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. For DGs 2A-A and 2B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- 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 shutdown boards, b. Load shedding from shutdown boards, and c. DG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds, 2. Energizes auto-connected emergency loads through load sequence timers, 3. Achieves steady state voltage ≥ 6800 V and ≤ 7260 V, 4. Achieves steady state frequency ≥ ~~58.8~~ 59.8 Hz and ≤ ~~61.2~~ 60.2 Hz, and 5. Supplies permanently connected and auto-connected emergency l ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

ATTACHMENT 2

Proposed TS Bases Changes (Mark-Ups) for SQN Units 1 and 2

(For Information Only)

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. 8). 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 accordance with the recommendations of Regulatory Guide 1.9 (Ref. 3) and Regulatory Guide 1.108 (Ref. 9).

Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum steady state output voltage of 6210 V is 90% of the nominal 6900 V output voltage. This value, which is specified in ANSI C84.1 (Ref. 10), allows for voltage drop to the terminals of 6600 V motors whose minimum operating voltage is specified as 90% or 5940 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 7260 V is equal to the maximum operating voltage specified for 6600 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 6600 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.

The steady state minimum and maximum frequency values are 59.8 Hz and 60.2 Hz, which are consistent with the recommendations in Regulatory Guide 1.9 (Ref. 3). These values ensure that the safety related plant equipment powered from the DGs is capable of performing its safety functions.

BASES

During this testing, the diesel is not in an accident mode and the frequency is controlled by the operator instead of the governor's accident speed reference.

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.

To minimize the wear on moving parts that do not get lubricated when the engine is not running, these SRs are modified by a Note (Note 1 for SR 3.8.1.2 and Note for SR 3.8.1.7) to indicate that all DG starts for these Surveillances may be preceded by an engine prelube period and followed by a warmup period prior to loading.

For the purposes of SR 3.8.1.2 and SR 3.8.1.7 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 recommendations.

In order to reduce stress and wear on diesel engines, the manufacturer recommends a modified start 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 Note 2.

SR 3.8.1.7 requires that the DG starts from 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).

The 10 second start requirement is not applicable to SR 3.8.1.2 (see Note 2) 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.

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.

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 3.8.1.9

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 (600 kW) without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. 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 board, or

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

and

Consistent with Regulatory Guide 1.9 (Ref. 3), the load rejection maximum transient acceptable if the increase in diesel speed does not exceed 75% of the difference between synchronous speed and the overspeed trip setpoint, or 15% above synchronous speed, whichever is lower.

The time, 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 3 seconds specified is equal to 60% of a typical 5 second load sequence interval associated with sequencing of the largest load. 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 Note 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 see under design basis accident conditions. Under certain conditions, however, the Note 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 boards that are too high.

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. 8). 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 accordance with the recommendations of Regulatory Guide 1.9 (Ref. 3) and Regulatory Guide 1.108 (Ref. 9).

Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum steady state output voltage of 6210 V is 90% of the nominal 6900 V output voltage. This value, which is specified in ANSI C84.1 (Ref. 10), allows for voltage drop to the terminals of 6600 V motors whose minimum operating voltage is specified as 90% or 5940 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 7260 V is equal to the maximum operating voltage specified for 6600 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 6600 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.

The steady state minimum and maximum frequency values are 59.8 Hz and 60.2 Hz, which are consistent with the recommendations in Regulatory Guide 1.9 (Ref. 3). These values ensure that the safety related plant equipment powered from the DGs is capable of performing its safety functions.

During this testing, the diesel is not in an accident mode and the frequency is controlled by the operator instead of the governor's accident speed reference.

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.

To minimize the wear on moving parts that do not get lubricated when the engine is not running, these SRs are modified by a Note (Note 1 for SR 3.8.1.2 and Note for SR 3.8.1.7) to indicate that all DG starts for these Surveillances may be preceded by an engine prelube period and followed by a warmup period prior to loading.

For the purposes of SR 3.8.1.2 and SR 3.8.1.7 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 recommendations.

In order to reduce stress and wear on diesel engines, the manufacturer recommends a modified start 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 Note 2.

SR 3.8.1.7 requires that the DG starts from 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).

The 10 second start requirement is not applicable to SR 3.8.1.2 (see Note 2) 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.

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.

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 3.8.1.9

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 (600 kW) without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. 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 board, or

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

and

Consistent with Regulatory Guide 1.9 (Ref. 3), the load rejection maximum transient acceptable if the increase in diesel speed does not exceed 75% of the difference between synchronous speed and the overspeed trip setpoint, or 15% above synchronous speed, whichever is lower.

The time, 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 3 seconds specified is equal to 60% of a typical 5 second load sequence interval associated with sequencing of the largest load. 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 Note 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 see under design basis accident conditions. Under certain conditions, however, the Note 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 boards that are too high.

ATTACHMENT 3

Proposed TS Changes (Final Typed) for SQN Units 1 and 2

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.2	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 2. A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. ---------- Verify each DG starts from standby conditions and achieves steady state voltage ≥ 6800 V and ≤ 7260 V, and frequency ≥ 59.8 Hz and ≤ 60.2 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 SR 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 ≥ 3960 kW and ≤ 4400 kW.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each engine-mounted “day” tank contains ≥ 250 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 engine-mounted “day” tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to transfer fuel oil from the storage system to the engine-mounted “day” tanks.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.7	----------NOTE---------- All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 6800 V and frequency ≥ 58.8 Hz and b. Steady state voltage ≥ 6800 V and ≤ 7260 V, and frequency ≥ 59.8 Hz and ≤ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.8	----------NOTES---------- 1. For the 1A, 1B, 1C, and 1D Unit Boards, this Surveillance shall not normally be performed in MODE 1 or 2. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. 2. Transfer capability is only required to be met for 6.9 kV Unit Boards that require normal and alternate power supplies. ---------- Verify automatic and manual transfer of the power supply to each 6.9 kV Unit Board from the normal supply to the alternate supply.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.9	----------NOTE---------- If performed with the 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 rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ 66.5 Hz, b. Within 3 seconds following load rejection, the voltage is ≥ 6800 V and ≤ 7260 V, and c. Within 3 seconds following load rejection, the frequency is ≥ 59.8 Hz and ≤ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. For DGs 1A-A and 1B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of shutdown boards, b. Load shedding from shutdown boards, c. DG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds, 2. Energizes auto-connected shutdown loads through load sequence timers, 3. Maintains steady state voltage ≥ 6800 V and ≤ 7260 V, 4. Maintains steady state frequency ≥ 59.8 Hz and ≤ 60.2 Hz, and 5. Supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	----------NOTES---------- 1. All DG starts may be preceded by prelube period. 2. For DGs 1A-A and 1B-B, this Surveillance shall not normally be performed in MODE 1 or 2. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ----------	
	Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and: a. In ≤ 10 seconds after auto-start and during tests, achieves voltage ≥ 6800 V and frequency ≥ 58.8 Hz, b. Achieves steady state voltage ≥ 6800 V and ≤ 7260 V and frequency ≥ 59.8 Hz and ≤ 60.2 Hz, c. Operates for ≥ 5 minutes, d. Permanently connected loads remain energized from the offsite power system, and e. Emergency loads are energized from the offsite power system.	In accordance with the Surveillance Frequency Control Program

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 ≥ 3960 kW and ≤ 4400 kW and ≥ 2140 kvar and ≤ 2370 kvar. Momentary transients outside of load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 6800 V and frequency ≥ 58.8 Hz and b. Steady state voltage ≥ 6800 V, and ≤ 7260 V and frequency ≥ 59.8 Hz and ≤ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	----------NOTE---------- For DGs 1A-A and 1B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- 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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. For DGs 1A-A and 1B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- 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 shutdown boards, b. Load shedding from shutdown boards, and c. DG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds, 2. Energizes auto-connected emergency loads through load sequence timers, 3. Achieves steady state voltage ≥ 6800 V and ≤ 7260 V, 4. Achieves steady state frequency ≥ 59.8 Hz and ≤ 60.2 Hz, and 5. Supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.2	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 2. A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. ---------- Verify each DG starts from standby conditions and achieves steady state voltage ≥ 6800 V and ≤ 7260 V, and frequency ≥ 59.8 Hz and ≤ 60.2 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 SR 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 ≥ 3960 kW and ≤ 4400 kW.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each engine-mounted “day” tank contains ≥ 250 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 engine-mounted “day” tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to transfer fuel oil from the storage system to the engine-mounted “day” tanks.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.7	----------NOTE---------- All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 6800 V and frequency ≥ 58.8 Hz and b. Steady state voltage ≥ 6800 V and ≤ 7260 V, and frequency ≥ 59.8 Hz and ≤ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.8	----------NOTES---------- 1. For the 2A, 2B, 2C, and 2D Unit Boards, this Surveillance shall not normally be performed in MODE 1 or 2. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. 2. Transfer capability is only required to be met for 6.9 kV Unit Boards that require normal and alternate power supplies. ---------- Verify automatic and manual transfer of the power supply to each 6.9 kV Unit Board from the normal supply to the alternate supply.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.9	----------NOTE---------- If performed with the 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 rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ 66.5 Hz, b. Within 3 seconds following load rejection, the voltage is ≥ 6800 V and ≤ 7260 V, and c. Within 3 seconds following load rejection, the frequency is ≥ 59.8 Hz and ≤ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. For DGs 2A-A and 2B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of shutdown boards, b. Load shedding from shutdown boards, c. DG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds, 2. Energizes auto-connected shutdown loads through load sequence timers, 3. Maintains steady state voltage ≥ 6800 V and ≤ 7260 V, 4. Maintains steady state frequency ≥ 59.8 Hz and ≤ 60.2 Hz, and 5. Supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	----------NOTES---------- 1. All DG starts may be preceded by prelube period. 2. For DGs 2A-A and 2B-B, this Surveillance shall not normally be performed in MODE 1 or 2. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and: a. In ≤ 10 seconds after auto-start and during tests, achieves voltage ≥ 6800 V and frequency ≥ 58.8 Hz, b. Achieves steady state voltage ≥ 6800 V and ≤ 7260 V and frequency ≥ 59.8 Hz and ≤ 60.2 Hz, c. Operates for ≥ 5 minutes, d. Permanently connected loads remain energized from the offsite power system, and e. Emergency loads are energized from the offsite power system.	In accordance with the Surveillance Frequency Control Program

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 ≥ 3960 kW and ≤ 4400 kW and ≥ 2140 kvar and ≤ 2370 kvar. Momentary transients outside of load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 6800 V and frequency ≥ 58.8 Hz and b. Steady state voltage ≥ 6800 V, and ≤ 7260 V and frequency ≥ 59.8 Hz and ≤ 60.2 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	----------NOTE---------- For DGs 2A-A and 2B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- 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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.18	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. For DGs 2A-A and 2B-B, this Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- 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 shutdown boards, b. Load shedding from shutdown boards, and c. DG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds, 2. Energizes auto-connected emergency loads through load sequence timers, 3. Achieves steady state voltage ≥ 6800 V and ≤ 7260 V, 4. Achieves steady state frequency ≥ 59.8 Hz and ≤ 60.2 Hz, and 5. Supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

ATTACHMENT 4

Proposed TS Bases Changes (Final Typed) for SQN Units 1 and 2

(For Information Only)

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. 8). 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 accordance with the recommendations of Regulatory Guide 1.9 (Ref. 3) and Regulatory Guide 1.108 (Ref. 9).

Where the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum steady state output voltage of 6210 V is 90% of the nominal 6900 V output voltage. This value, which is specified in ANSI C84.1 (Ref. 10), allows for voltage drop to the terminals of 6600 V motors whose minimum operating voltage is specified as 90% or 5940 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 7260 V is equal to the maximum operating voltage specified for 6600 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 6600 V motors is no more than the maximum rated operating voltages. The steady state minimum and maximum frequency values are 59.8 Hz and 60.2 Hz, which are consistent with the recommendations in Regulatory Guide 1.9 (Ref. 3). These values ensure that the safety related plant equipment powered from the DGs is capable of performing its safety functions.

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.

To minimize the wear on moving parts that do not get lubricated when the engine is not running, these SRs are modified by a Note (Note 1 for SR 3.8.1.2 and Note for SR 3.8.1.7) to indicate that all DG starts for these Surveillances may be preceded by an engine prelube period and followed by a warmup period prior to loading.

For the purposes of SR 3.8.1.2 and SR 3.8.1.7 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 recommendations.

In order to reduce stress and wear on diesel engines, the manufacturer recommends a modified start 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 Note 2.

SR 3.8.1.7 requires that the DG starts from 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).

The 10 second start requirement is not applicable to SR 3.8.1.2 (see Note 2) when a modified start procedure as described above is used. During this testing, the diesel is not in an accident mode and the frequency is controlled by the operator instead of the governor's accident speed reference. If a modified start is not used, the 10 second start requirement of SR 3.8.1.7 applies.

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.

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 3.8.1.9

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 (600 kW) without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. 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 board, or

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

Consistent with 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, or 15% above synchronous speed, whichever is lower.

The time and voltage tolerances specified in this SR are derived from Regulatory Guide 1.9 (Ref. 3) recommendations for response during load sequence intervals. The 3 seconds specified is equal to 60% of a typical 5 second load sequence interval associated with sequencing of the largest load. The voltage and maximum transient 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 Note 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 see under design basis accident conditions. Under certain conditions, however, the Note 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 boards that are too high.

BASES

SURVEILLANCE REQUIREMENTS

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SR 3.8.1.1

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.2 and SR 3.8.1.7

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SURVEILLANCE REQUIREMENTS (continued)

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