Xcel Energy®

JUN 09 2014

L-PI-14-037
10 CFR 50.90

U S Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Prairie Island Nuclear Generating Plant Units 1 and 2
Dockets 50-282 and 50-306
Renewed License Nos. DPR-42 and DPR-60

License Amendment Request (LAR) to Revise Technical Specification (TS) 3.8.1, "AC Sources – Operating", Emergency Diesel Generator Voltage and Frequency Limits

Pursuant to 10 CFR 50.90, Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), hereby requests an amendment to the TS for the Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, to revise the steady state voltage and frequency limits in TS 3.8.1 Surveillance Requirements (SRs) 3.8.1.2, 3.8.1.6 and 3.8.1.9. NSPM evaluated the changes proposed in this LAR in accordance with 10 CFR 50.92 and concluded that they involve no significant hazards consideration.

The enclosure to this letter, "Evaluation of the Proposed Changes", contains the licensee's evaluation of the proposed changes.

NSPM requests approval of this LAR within one calendar year of the submittal date. Upon NRC approval, NSPM requests 90 days to implement the associated changes. In accordance with 10 CFR 50.91, NSPM is notifying the State of Minnesota of this LAR by transmitting a copy of this letter and enclosure to the designated State Official.

If there are any questions or if additional information is needed, please contact Mr. Dale Vincent, P.E., at 651-267-1736.

1717 Wakonade Drive East • Welch, Minnesota 55089-9642
Telephone: 651.388.1121

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments

I declare under penalty of perjury that the foregoing is true and correct.
Executed on JUN 09 2014

Kevin Davison

Kevin Davison
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosures (1)

cc: Administrator, Region III, USNRC
Project Manager, PINGP, USNRC
Resident Inspector, PINGP, USNRC
State of Minnesota

ENCLOSURE

Evaluation of the Proposed Changes

License Amendment Request (LAR) to Revise Technical Specification (TS) 3.8.1, "AC Sources – Operating", Emergency Diesel Generator Voltage and Frequency Limits

---

ATTACHMENTS:

1. Technical Specification Pages (Markup)
2. Technical Specification Bases Pages (Markup)
3. Technical Specification Pages (Retyped)

1. SUMMARY DESCRIPTION

This evaluation supports a request to amend Renewed Operating Licenses DPR-42 and DPR-60 for Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, respectively.

Pursuant to 10 CFR 50.90, Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), hereby requests an amendment to the TS for PINGP, Units 1 and 2, to revise Surveillance Requirements (SRs) in TS 3.8.1. Specifically, this LAR proposes to revise the steady state voltage and frequency range limits in SRs 3.8.1.2, 3.8.1.6 and 3.8.1.9 which have been identified as non-conservative.

Currently EDG steady state voltage and frequency ranges in TS 3.8.1 which were identified as non-conservative are administratively controlled under the provisions of NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications That Are Insufficient to Assure Plant Safety", (Agencywide Documents Access and Management System (ADAMS) Accession No. ML031110108) to assure that plant safety is maintained. In accordance with the guidance of Administrative Letter 98-10, NSPM submits this LAR as a requirement to resolve non-conservative TS, that is, this is not a "voluntary request from a licensee to change its licensing basis" and should not be subject to "forward fit" considerations.

2. DETAILED DESCRIPTION

2.1 Proposed Changes

A brief description of the associated proposed TS changes is provided below along with a discussion of the justification for each change. The specific wording changes to the TS are provided in Attachments 1 and 3 to this enclosure.

TS 3.8.1, "AC Sources – Operating", SR 3.8.1.2: This LAR proposes to revise this surveillance test to: increase the steady state lower voltage limit from 3740 VAC to 4084 VAC; decrease the steady state upper voltage limit from 4580 VAC to 4400 VAC; increase the steady state lower frequency limit from 58.8 Hz to 59.5 Hz; and, decrease the steady state upper frequency limit from 61.2 Hz to 60.5 Hz. These changes are acceptable because they will assure that the emergency diesel generators (EDGs) supply electrical power within voltage and frequency limits at which the supplied equipment will operate to perform their required safety functions.

TS 3.8.1, "AC Sources – Operating", SR 3.8.1.6: This LAR proposes to revise this surveillance test to: increase the steady state lower voltage limit from 3740 VAC to 4084 VAC; decrease the steady state upper voltage limit from 4580 VAC

to 4400 VAC; increase the steady state lower frequency limit from 58.8 Hz to 59.5 Hz; and, decrease the steady state upper frequency limit from 61.2 Hz to 60.5 Hz. These changes are acceptable because they will assure that the EDGs supply electrical power within voltage and frequency limits at which the supplied equipment will operate to perform their required safety functions.

TS 3.8.1, "AC Sources – Operating", SR 3.8.1.9: This LAR proposes to revise this surveillance test to: increase the steady state lower voltage limit from 3740 VAC to 4084 VAC; decrease the steady state upper voltage limit from 4580 VAC to 4400 VAC; increase the steady state lower frequency limit from 58.8 Hz to 59.5 Hz; and, decrease the steady state upper frequency limit from 61.2 Hz to 60.5 Hz. These changes are acceptable because they will assure that the EDGs supply electrical power within voltage and frequency limits at which the supplied equipment will operate to perform their required safety functions.

Although Bases changes are not a part of this LAR, Attachment 2 to this enclosure includes marked up Bases pages for information. The changes proposed in Attachment 2 are directly related to the changes proposed to TS 3.8.1.

In summary these changes are acceptable because they assure the plant is operated in a safe manner.

2.2 Background

NRC Information Notice (IN) 2007-09, "Equipment Operability Under Degraded Voltage Conditions," identified a nuclear power facility at which the EDG surveillance test procedure specified minimum required EDG voltage, based on TS requirements, was below the calculated minimum voltage required for component operability. The PINGP corrective action concluded that the Technical Specification minimum voltage value at steady state for the EDG was non-conservative to the lower limit of 3944 VAC identified in TS section 3.3.4, "4 kV Safeguards Bus Voltage Instrumentation". EDG voltage that is too low will not be sufficient to satisfy EDG safeguards loads. Low voltage conditions could also cause an increase in motor current which may cause some motor loads to trip on overcurrent. Thus, NSPM determined that a similar condition may exist at PINGP which is considered a non-conservative TS under the guidance of NRC Administrative Letter 98-10 (ML031110108).

The NRC in Regulatory Guide 1.9, Revision 3, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants," Regulatory Position C.1.5 identified that the EDG design should include provisions so that testing of the units will simulate the parameters of operation that would be expected if actual demand were to be placed on the system.

In mid-2006, the PINGP licensee identified in the corrective action program that:

Emergency Diesel Generator (EDG) frequency is allowed to vary within a band of 60 Hz plus or minus 1.2 Hz (2% variance). Changes in EDG frequency will affect the performance of the components (primarily pumps) that are powered from the EDG. For example, speed is proportional to frequency, pump flow rate is directly proportional to speed and pump discharge head is proportional to speed squared. Analyses, such as system hydraulic evaluations and MOV actuator sizing calculations have not considered the impacts from these potential EDG frequency changes.

This issue is considered a non-conservative TS under the guidance of NRC Administrative Letter 98-10 (ML031110108).

Administrative Letter 98-10 (ML031110108) provides guidance for correction of facility TS when they are found to contain non-conservative values. The NRC staff expressed their expectation in Administrative Letter 98-10 that, following imposition of administrative controls, an amendment to the TS will be submitted in a timely fashion. The licensee has imposed administrative controls on the plant operations which require verification that EDG steady state output voltage is greater than or equal to 4084 VAC and less than or equal to 4400 VAC and the frequency is within the range of 59.5 Hz to 60.5 Hz.

Subsequent to identification of the EDG frequency and voltage issues, NSPM has participated in nuclear industry initiatives for generic resolution of these issues. Pursuant to NRC Staff guidance, NSPM submits this LAR independent of the ongoing industry initiatives.

(Note that this document refers to 4 kV buses which are actually 4160 VAC: these terms may be used interchangeably.)

With the TS changes proposed in this LAR, the plant will continue to operate safely and the health and welfare of the public is protected.

3. TECHNICAL EVALUATION

PINGP is a two unit plant located on the right bank of the Mississippi River approximately 6 miles northwest of the city of Red Wing, Minnesota. The facility is owned and operated by Northern States Power Company, a Minnesota corporation (NSPM). Each unit at PINGP employs a two-loop pressurized water reactor designed and supplied by Westinghouse Electric Corporation. The initial PINGP application for a Construction Permit and Operating License was submitted to the Atomic Energy Commission (AEC) in April 1967. The Final Safety Analysis Report (FSAR) was submitted for application of an Operating License in January 1971. Unit 1 began commercial operation in December 1973 and Unit 2 began commercial operation in December 1974.

The PINGP was designed and constructed to comply with the licensee's understanding of the intent of the AEC General Design Criteria (GDC) for Nuclear Power Plant Construction Permits, as proposed on July 10, 1967. PINGP was not licensed to NUREG-0800, "Standard Review Plan (SRP)", and was not part of the NRC Systematic Evaluation Program (SEP).

EDG Description

Unit 1 EDGs

The Unit 1 EDGs, D1 and D2, are Fairbanks-Morse opposed piston EDGs which provide onsite standby power sources for 4 kV safeguards buses 15 and 16. These EDGs are each rated at 2750 kW continuous (8760 hour basis), 0.8 power factor, 900 rpm, 4160 VAC, three phase, 60 Hertz, synchronous generators. The 1,000 hour rating of each EDG is 3000 kilowatts. The 30 minute rating of each unit is 3250 kW maximum. D1 and D2 were sized and preoperational tested in accordance with the guidance of Safety Guide 9.

The D1 and D2 governor systems utilize a Woodward UG-8 mechanical-hydraulic dial-type governor system. The design specifications for this equipment indicate a steady-state speed / frequency (900 rpm / 60 Hz) band of ± 0.25 percent of rated speed from the set-point for the engine being controlled. The emergency-mode function of the governor system is to maintain rated engine speed / frequency of 900 rpm / 60 Hz while the generator supplies power to required loads. The governor system is designed to maintain the pre-set speed of 900 rpm / 60 Hz (set-point) independent of the load applied to the generator. This is accomplished by regulating the amount of fuel supplied to the engine.

Unit 2 EDGs

The Unit 2 EDGs, D5 and D6, consist of two tandem-drive units (gensets) manufactured by Societe Alsacienne de Constructions Mecaniques de Mulhouse (SACM) which provide onsite standby power sources for 4 kV safeguards buses 25 and 26. These EDGs are each rated at 5400 kW continuous (8760 hour basis), 0.8 power factor, 1200 rpm, 4160 VAC, 3-phase, 60 Hertz. Each engine is a SACM UD45 V-16, four-cycle diesel engine; that is, the 5400 kW generator is driven by two V-16 engines which share the load with a common electronic governor system. Subsequent to purchase of D5 and D6 for use at PINGP, Wärtsilä bought SACM; thus, the engine vendor is now known as Wärtsilä SACM. D5 and D6 meet the design and acceptance testing requirements of Regulatory Guide (RG) 1.9, Revision 2, except portions of the 1984 Edition of IEEE 387 were implemented in the factory testing instead of the 1977 revision.

The D5 and D6 governor systems utilize a Woodward 2301A electronic governor system with a Woodward EGB-35-P actuator on each engine of the two tandem sets. (The EGB-35-P actuator is an electric, proportional output actuator with an integral

backup mechanical centrifugal governor. The 2301A load sharing and speed control box, feedback devices, and integrating electric control actuator (EGB-35-P) comprise the complete governing system.) The design specifications for this equipment indicate a steady-state speed / frequency (1200 rpm / 60 Hz) band of ± 0.25 percent of rated speed from the set-point for the engine(s) being controlled. The emergency-mode function of the governor system is to maintain rated engine speed / frequency of 1200 rpm / 60 Hz while the generator supplies power to required loads. The governor system is designed to maintain the pre-set speed of 1200 rpm / 60 Hz (set-point) independent of the load applied to the generator. This is accomplished by regulating the amount of fuel supplied to each engine of the tandem set.

Degraded Voltage Response

With degraded voltage on any of the four safeguards 4160 VAC buses, the associated Programmable Logic Controller (PLC) based load sequencer automatically initiates the following steps after a 60 second delay:

a. Auto start the EDG and trip the offsite source breakers to the bus.
b. Load rejection of the designated loads on the bus.
c. Close the breaker to the EDG once it has met established voltage and frequency criteria (within 10 seconds of receiving start signal).
d. Load restoration by sequencing loads at 5 second intervals.

If a safety injection (SI) signal is received during the 60 second degraded voltage time delay, the above logic is immediately actuated by the load sequencer with SI loads added during the last step, item d.

Current TS Requirements, Basis and Limitations

The original plant TS did not contain requirements for verification that the EDG frequency and output voltage were within specific ranges. These test requirements were first introduced into the TS for monthly (SR 3.8.1.2) and six month (SR 3.8.1.6) tests by license amendments (LA) 91 and 84 for Units 1 and 2, respectively (LA-91/84) (ML022210226), which approved an LAR submitted March 17, 1986. These original test requirements (SRs) required verification that the generator voltage and frequency is at 4160 ± 420 VAC (nominal voltage ± ten percent) and 60 ± 1.2 Hz (nominal frequency ± two percent). Neither the LAR nor the safety evaluation (SE) for LA-91/84 specifically addressed the basis for the new surveillance test requirements to verify generator voltage and frequency. The LAR Determination of Significant Hazards Considerations discussion stated:

> The proposed changes to the surveillance requirements, while less restrictive than the existing requirements, conform to recent NRC Staff guidance provided in Generic Letter 84-15 and North Anna License Amendment Safety Evaluation Report dated April 25, 1985.

Model TS were provided in Generic Letter (GL) 84-15 which included verification that the generator voltage and frequency is 4160 ± 420 VAC and 60 ± 1.2 Hz. However, the thrust of both referenced documents (GL 84-15 and the North Anna LA) was improved EDG reliability and they do not discuss the basis for including these new tests in the TS or the basis for the voltage and frequency ranges. Additionally, no insight on the basis for the voltage and frequency verification and ranges are provided in the NRC SE for LA-91/84 (ML022210226) which stated, "In order to reflect the guidance of GL 84-15, the licensee proposes to modify TS 4.6.A.1.e, TS 4.6.A.1.f and TS 4.6.A.3.(b) and add a new section TS 4.6.A.2, which establishes the testing requirements for the six month interval."

PINGP was modified in 1992 to power the Unit 1 safeguards buses from EDGs D1 and D2 and to power the Unit 2 safeguards buses from newly installed EDGs D5 and D6. LA-103/96 (ML022240504) revised the TS to include provisions for testing D5 and D6 and also revised the requirements for the 24 hour test as follows:

> Specification 4.6.A.3.c is revised to add 18-month full load carrying capacity tests of each EDG for an interval of not less than 24 hours of which 2 hours are at a load equal to 105 -110 percent of the continuous rating of an EDG and 22 hours are at a load equal to 90 -100 percent of the continuous rating. During this test, the voltage and frequency are to be verified to be 4160 ± 420 volts and 60 ± 1.2 Hertz. This revision is acceptable.

Prior to conversion to improved TS (ITS), the TS required a monthly EDG test to, "Verify the generator voltage and frequency can be adjusted to 4160±420 volts and 60±1.2 Hz", and a six month test to, "Verify the diesel generator starts and achieves generator voltage and frequency of 4160±420 volts and 60±1.2 Hz with 10 seconds after the start signal."

Current TS 3.8.1 SR 3.8.1.2, SR 3.8.1.6.b, and SR 3.8.1.9.c require verification that the EDGs achieve "steady state voltage ≥ 3740 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz" during performance of these tests. These requirements were incorporated into the TS in their current form with the TS conversion to improved TS (ITS) by LA-158/149 (ML022070613) which followed the format and content guidance of NUREG-1431, "Improved Standard Technical Specifications, Westinghouse Plants", Revision 1. This LA did not make any substantive changes to the surveillance test technical requirements for verification of EDG voltage and frequency.

Proposed Changes

This LAR proposes to revise TS 3.8.1 SR 3.8.1.2, SR 3.8.1.6.b, and SR 3.8.1.9.c by increasing the lower steady state voltage limit of the acceptable range from 3740 VAC to 4084 VAC, decrease the steady state upper voltage limit from 4580 VAC to 4400 VAC, increase the steady state lower frequency limit from 58.8 Hz to 59.5 Hz, and decrease the steady state upper frequency limit from 61.2 Hz to 60.5 Hz.

SR 3.8.1.2 will state:

> Verify each DG [diesel generator] starts from standby conditions and achieves steady state voltage ≥ 4084 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.

SR 3.8.1.6 will state:

> Verify each DG starts from standby condition and achieves:
>
> b. Steady state voltage ≥ 4084 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.

SR 3.8.1.9 will state:

> Verify each DG operates for ≥ 24 hours:
>
> a. For ≥ 2 hours loaded:
>
> Unit 1 ≥ 2832 kW, and
> ≤ 3000 kW
>
> Unit 2 ≥ 5400 kW, and
> ≤ 5940 kW; and
>
> b. For the remaining hours of the test loaded:
>
> Unit 1 ≥ 2500 kW, and
>
> Unit 2 ≥ 4860 kW; and
>
> c. Achieves steady state voltage ≥ 4084 V and ≤ 4400 V; and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.

These are the only PINGP TS SRs which contain requirements for EDG steady state voltage and frequency; therefore, these are the SRs for which changes are proposed. The PINGP TS SRs are based on the content and guidance of NUREG-1431, Revision 1, and the TS as they existed prior to conversion to the content and guidance of NUREG-1431.

Each of these SRs specifies required conditions at "steady state" which is consistent with the terminology used in the Standard Technical Specifications (NUREG-1431), however, this term is not defined. The TS Bases 3.8.1 changes provided for information in Attachment 2 provide the definition and basis for determination of when the EDGs achieve steady state conditions.

Technical Basis for Voltage Limit Changes

The proposed TS 3.8.1 lower limit of 4084 VAC (98.2% of 4160 V) for SR 3.8.1.2, SR 3.8.1.6 and SR 3.8.1.9 was chosen based the setpoint calculations as implemented by the design of the load sequencer at the PINGP. A ready to load relay (RTLR) permissive is provided to the EDGs. Once voltage (set at 95% for pickup) and frequency setpoints for the EDG have been satisfied, load restoration can occur. The criterion for continued load sequencing for the EDGs is that a degraded voltage condition is not present as identified in the load sequencer technical manual. The degraded voltage relay (DVR) dropout value is currently set at 95.4% but can be between 94.8% and 96.2% of 4160 VAC as discussed in Section 8.3.3 of the PINGP Updated Safety Analysis Report (USAR). The DVR reset value is 0.6% above the DVR dropout value. Once the DVR reset value is reached, a degraded voltage condition is not present. The proposed TS 3.8.1 lower limit of 4084 VAC for the EDGs is greater than the upper value of the DVR dropout range plus 0.6% (96.8%). At this voltage level, the DVR relay will reset (degraded voltage condition not present) and will permit the EDGs to continue to accept loads based on the load sequencer design while supplying adequate voltage to the connected loads. This voltage value of 4084 VAC is also above the voltage value of 4002 VAC (96.2% of 4160 VAC) for the upper degraded voltage limit at the 4160 VAC safeguards buses per T.S. SR 3.3.4.3.

As discussed in Section 8 of the USAR:

> The analysis results were used to establish operating guidelines which guarantee a minimum 4160V safeguards bus voltage of 94.8% to allow long term operation on offsite power without actuating degraded voltage protection relays (set at 95.5 ± .7%). Testing and analysis (Reference 19 [degraded voltage calculation]) have shown that all safeguards loads will operate properly at or above the minimum degraded voltage setpoint.

This LAR proposes to reduce the upper limit of allowable steady state voltage from 4580V to 4400V which is the current administratively controlled upper limit. This reduced value is consistent with the ratings on nominal 4 kV equipment including 4 kV motors, 4160V switchgear and cabling (5kV), and the nominal 480V equipment including the 480V transformers (600V), switchgear (600V), motors (460V) and cabling (600V). Existing protective relay calculations for 4160V switchgear were calculated using 4400V for short circuit calculations, and considered the operating band of 75-110% of nominal 4 kV motor rating (3000V - 4400V) for protective relay settings, which bound the proposed voltage limit changes.

TS Allowable Value and Instrument Uncertainty

The analytical limit (AL) for safeguards equipment operability which supports the allowable value (AV) of 94.8% is 94.5% at the 4160 VAC buses. This AL is used in the electrical calculations identified in the following discussions to demonstrate adequate

voltage. Instrument uncertainties for the degraded voltage relays at the safeguards 4160 VAC buses were included in the AL per the plant setpoint calculation. Instrument uncertainties for the DVR dropout took into consideration potential transformer (PT) accuracy, relay accuracy, relay setting tolerance and test equipment performance. The "Square Root of the Sum of the Squares (SRSS)" methodology was used to combine uncertainty terms to determine total loop uncertainty per the setpoint methodology used at PINGP. The setpoint calculation shows that the AV for the degraded voltage relay setpoint is 94.7% of 4160 VAC. This value bounds the DVR dropout range of 95.5% ± .7% identified in Section 8 of the PINGP USAR and TS SR 3.3.4.3 (degraded voltage AV ≥3944 and ≤ 4002 VAC). The degraded voltage relay settings are based on this setpoint calculation. These degraded voltage relays monitor safeguards 4 kV bus voltage and are used in the EDG load shedding and load restoration scheme. The reset values for these DVR relays are 0.6% above the dropout values. The actual plant setting for the DVR dropout is 95.4% of 4160 VAC. Therefore, actual plant setting for the DVR reset would occur at 96.0%. However, the DVR dropout range identified in the setpoint calculation and PINGP USAR section 8.3.3 is 95.5 ± 0.7% (94.8% to 96.2%). With an upper limit of 96.2% as the DVR dropout value, the DVR reset value would be 96.8% (4027 VAC). Once the DVR is reset, a degraded voltage condition is not present. The proposed TS minimum voltage value of 4084 VAC will allow continued sequencing of safeguards loads onto the EDGs by providing adequate voltage to clear a degraded voltage condition.

Degraded Voltage Calculation

The electrical distribution system for voltages 4 kV and under at PINGP is modeled using Electrical Transient Analysis Program (ETAP) software. Safeguards equipment performance is analyzed in accordance with an electrical calculation which models the PINGP electrical distribution system voltages 4 kV and under using ETAP. A degraded voltage study case was generated along with numerous plant configurations per the calculation. The configurations include degraded voltage (94.5% of 4160V: 3931 VAC) at the 4 kV safeguards bus while Unit 1 and Unit 2 are at normal conditions or experiencing a combination of events (such as hot shutdown or loss of coolant accident (LOCA)). Acceptance criterion is largely based on voltage being greater than 90% at the loads. The degraded voltage calculation concluded that safeguards equipment will continue to operate when the safeguards 4160 VAC buses degraded to 94.5% of 4160 VAC (3931 VAC). Therefore, this analysis supports the lower degraded voltage value of 3944 VAC (TS SR 3.3.4.3) at the 4 kV buses and also bounds the proposed TS value of 98.2% (4084 VAC) at the 4160 VAC buses.

Motor operated valve (MOV) performance is also evaluated for the degraded voltage condition. Voltage at the motor control centers (MCCs) identified in the degraded voltage calculation provides the MCC voltage input to the PINGP MOV calculations. During degraded voltage conditions, the MOV calculations demonstrate acceptable performance.

Undervoltage Protection Considerations

Safeguards bus (4 kV) voltage protection is provided by 12 voltage relays: four relays are associated with degraded voltage which actuate at approximately 95% of nominal voltage; four undervoltage relays which actuate at approximately 75% of nominal voltage; and four loss of voltage relays which actuate at 25% of nominal voltage. The undervoltage 75% of nominal setting was selected based on operation of equipment for short periods of time without damage. Time delays as specified in TS 3.3.4 are applied within the undervoltage and degraded voltage functions to prevent actuation during normal transients. An EDG start time delay is also provided in the degraded voltage function to allow the condition to be corrected by external actions within a time period that will not cause damage to operating equipment. The time delay associated with the undervoltage relays is 4±1.5 seconds. Time delays associated with the degraded voltage relays are 8±0.5 seconds for the degraded voltage time delay and degraded voltage EDG start time delay of 7.5 to 63 seconds. This undervoltage protection logic assures there is no impact to equipment powered from a safeguards bus during the undervoltage time delay.

Protective Relaying Calculations

Calculations were performed to analyze protective relay settings based on safeguards motors experiencing a reduced voltage of 75% of their rated motor voltage. Reduced voltage of 75% of rated voltage is below the lower limit for EDG voltage at steady state value of 4084 VAC. These analyses, performed using ETAP, demonstrated that the protective relay settings were appropriately selected and configured to account for a reduced voltage of 75% rated motor voltage and to verify that the overcurrent devices for the motors will not trip while running at 75% of rated voltage. The values in the calculations bound the proposed EDG TS lower limit of 4084 VAC.

Protective relaying calculations performed short circuit calculations using a maximum bus voltage of 4400V. Protective relaying functions considered operation between 75%-110% of motor nominal 4 kV rating. Therefore, the protective relay settings already assume the reduced upper voltage limits for short circuit and operational settings, and are consistent with the changes proposed in this LAR. Use of 75% of motor nominal 4 kV ensures that at the undervoltage relay setting of 75% of nominal, coordination is still maintained and no potential bus lockout could occur.

Analysis performed for setting of safeguards bus protective relays was completed at the proposed upper and lower voltage limits and determined there is no challenge to relay coordination.

Emergency Diesel Generator Loading Calculations

EDG loading calculations during a loss of offsite power (LOOP) with an SI event at PINGP were reviewed. The calculations used equipment nameplate values for the loads and would not be impacted by the lower limit EDG voltage at a steady state value

of 4084 VAC. The EDG loading calculations show that the ratings of the EDGs are adequate for supplying the safeguards loads.

The results of these calculations demonstrate that the proposed degraded voltage limit will ensure that safeguards loads supplied by the safeguards buses will perform their design safety functions. In the event that offsite power becomes unavailable, the emergency diesels will supply power to the 4160 VAC buses. The lower voltage limit of 4084 VAC from the EDGs ensure that voltage requirements at the 4160 VAC buses are met and the analytical limit of 94.5% at the 4160 VAC buses is preserved as demonstrated by the PINGP degraded voltage calculation.

Since each EDG is the alternate AC source for the opposite unit during a station blackout (SBO) event, loading during an SBO has also been considered. The EDGs (D1, D2, D5, D6) have been sized appropriately to carry the required loads under the SBO rule of 10CFR 50.63 and the related guidance of RG 1.155.

Emergency Diesel Generator Testing

The EDGs are tested monthly in a slow start with a fast start every six months to verify that the EDGs can come up to speed with the appropriate voltages and frequencies in accordance with TS and procedural requirements. Administrative controls limit bus loading to an EDG voltage band between 4084 and 4400. The test procedures formerly specified the steady state lower limit voltage of 3740 VAC for the EDGs to be consistent with SRs 3.8.1.2, 3.8.1.6 and 3.8.1.9 values of 3740 VAC. When the issue of EDG lower voltage was identified, administrative limits of 3944 VAC for the lower steady state voltage were initially established. With the development of this LAR, administrative limits of 4027 VAC were imposed and more recently limits of 4084 have been required. Reviews of surveillances performed in a recent five year period show that the steady state output voltage has been greater than 4084 VAC for each EDG. The EDGs are administratively limited to an upper voltage of 4400V.

The EDGs are also tested under loading conditions for 24 hours each refueling cycle. Verifications for adequate output voltage are made during these surveillance tests. Administrative limits of 4084 VAC have also been placed in these surveillance procedures in lieu of the TS SR 3.8.1.9 value of 3740 VAC. These surveillances also demonstrate that the EDG does not trip during and following a load rejection of greater than or equal to 650 kW for Unit 1 or greater than or equal to 860 kW for Unit 2 as required by TS SR 3.8.1.7. Review of 24 hour test surveillances performed in the years immediately following recording of this voltage value shows that the EDG voltage has remained higher than 4084 VAC during these tests. The EDGs are administratively limited to an upper voltage of 4400V.

Each refueling outage, the loads are stripped from the safeguard buses and loaded onto the EDGs during the integrated SI test. The intent of this test is to verify that safeguard loads are stripped and then are sequenced onto the EDGs as designed.

Based on the results of surveillance procedures, the EDGs are able to maintain steady state voltages between 4084 and 4400 VAC. Administrative limits ensure that the voltage at the 4 kV buses when supplied by the EDGs is maintained between 4084 and 4400 VAC.

Summary of Proposed Voltage Changes

The following table summarizes the percentage of nominal voltage (4160 VAC) and actual voltage used in documents, calculations and testing. As discussed above, the calculations demonstrated that the affected equipment (such as, pump motors, motor operated valves and protective relays) operates as required at the analysis values given in the table. The proposed TS test value is bounded by the analyses values. Review of EDG test results confirmed that the EDG maintains the output voltage within the proposed TS limits.

Description	**% Nominal Voltage**	**Lower Voltage**	**% Nominal Voltage**	**Upper Voltage**
Current TS SR 3.8.1.2, SR 3.8.1.6, SR 3.8.1.9	90	3740	110	4580
Current procedure administrative limits	98.2	4084	105.8	4400
Proposed TS SR 3.8.1.2, SR 3.8.1.6, SR 3.8.1.9	98.2	4084	105.8	4400
Degraded voltage relay calculation – analytical limit	94.5	3931	NA	NA
Degraded voltage relay calculation – analytical limit with uncertainties (allowable value)	94.7	3940	NA	NA
Safeguards loads degraded voltage operability calculation	94.5	3931	NA	NA
Motor operated valve degraded voltage operability calculation	94.5	3931	NA	NA
Protective relaying calculations for motors	75*	3000	110*	4400
Observed EDG steady state output voltage during surveillance testing	>98.2	>4084	<105.8	4400

* - % of rated motor voltage (4000 VAC)

Technical Basis for Frequency Limit Change

The proposed frequency limits were selected based on the capability of the EDGs to operate within these limits and the capability of the equipment which is supplied power by the EDGs to perform their safety functions when power is supplied within these limits. The performance of some equipment is bounded by operations at the lower frequency limit and other equipment may be bounded by operation at the upper limit. Equipment capability and bounding limitations are summarized in the following discussions.

Safeguard Features Systems Pump Performance

For induction motors, motor speed is directly proportional to power supply frequency. As power supply frequency varies pump speed varies causing variations in pump flow and discharge pressure. Pump flow is directly proportional to motor speed; thus, a percentage increase or decrease in supply frequency will result in the same percentage increase or decrease in pump flow. Pump discharge pressure is proportional to the square of motor speed; thus, a percentage increase or decrease in supply frequency will result in that percentage squared increase or decrease in pump discharge pressure. Calculations have been performed to show acceptable pump operation when the EDG frequency is maintained between 59.5 and 60.5 Hz.

If the EDG frequency is at the high end of the acceptable band (60.5 Hz), the pump flow and discharge pressure for pumps supplied by the EDG would be increased. Calculations were performed to evaluate the safeguards pumps supplied by the EDGs to ensure that this increase in pump speed would not cause the pump to be placed in a runout condition or exceed the maximum flow rate assumed in the safety analysis. The calculations demonstrate that the safeguards pumps will operate acceptably and perform their credited design functions given a supply frequency of 60.5 Hz.

If the EDG frequency is at the low end of the acceptable band (59.5 Hz), the pump flow and discharge pressure for the safeguards pumps supplied by the EDG would be decreased. Calculations were performed to evaluate the safeguards pumps supplied by the EDGs to ensure that this decrease in pump speed would not prevent the pumps from supplying their minimum credited flow. The calculations demonstrate that the pumps will operate acceptably and perform their credited design functions given a supply frequency of 59.5 Hz.

Motor Operated Valve (MOV) Performance

Operation of the EDGs at the high end of their frequency range may cause a higher differential pressure across MOVs as compared to nominal conditions. Calculations for MOV maximum expected differential pressure include an increased pump discharge pressure to account for maximum EDG frequency. The calculations assume a

maximum EDG frequency of 61.2 Hz, resulting in 4% higher pump discharge pressure. Since the TS changes proposed in this LAR results in a smaller EDG maximum frequency, the change will be conservative with respect to the calculations.

MOV stroke time may be negatively affected by lower EDG frequency, causing the MOV to operate more slowly. However, sufficient margin exists between actual stroke times and maximum allowed stroke times to account for the minimum expected EDG frequency. The TS changes proposed in this LAR will restrict the minimum allowed frequency to a higher value which assures MOV stroke times are acceptable.

Ventilation Systems Fan/Blower Performance

Since this LAR proposes an upper frequency limit value of 60.5 Hz and a lower frequency limit value of 59.5 Hz which results in a more restrictive allowable frequency band compared to the upper limit of 61.2 Hz and lower limit of 58.8 Hz in the current TS, the revised maximum and minimum steady-state frequency limits will have no adverse affect on ventilation systems fan/blower performance. Therefore, EDG operation within the new more restrictive frequency range will maintain operability of the engineered safety feature systems equipment required for the safe shutdown of the facility and for mitigation and control of accident conditions when powered by the EDG.

TS Allowable Value and Instrument Uncertainty

Frequency for the EDG governor is set to 60 Hz. Instrument uncertainties for the instrument loop monitoring EDG frequency was performed using the "Square Root of the Sum of the Squares (SRSS)" methodology to combine uncertainty terms to identify the total loop error per the setpoint methodology used at PINGP. The results of the calculations show that the total loop uncertainty is less than 0.5 Hz. Therefore, when the setting is 60 Hz, there is a > 95% certainty that measured frequency of the EDG will be between the proposed technical specifications frequency allowable values of 59.5 Hz and 60.5 Hz.

Emergency Diesel Generator Loading Calculations

EDG loading calculations during a loss of offsite power (LOOP) with an SI event at PINGP were reviewed. The calculations used equipment nameplate values for the loads and also consider frequency variation impacts on motor loads. Motor loading at 60.5 Hz were considered since frequency impacts motor speed. The pump affinity law was then applied to identify the increase in motor loading. The results of these calculations demonstrate that EDGs are sized adequately to support safeguards loads when considering a frequency increase of 0.5 Hz (60.5 Hz) from the nominal 60 Hz. EDG steady state loading for an SI event concurrent with a Loss of Offsite Power indicates D2 (Unit 1 Train B) to have the least margin at a time interval of 5 minutes to 30 minutes with a total loading of 2333.72 kW compared to the D2 continuous operation rating of 2750 kW. Unit 2 EDGs are each rated for 5400 kW and have considerably more margin compared to Unit 1 EDGs.

EDG loading during a station blackout (SBO) event has also been considered. The EDGs (D1, D2, D5, D6) have been sized appropriately to account for frequency to supply the required loads under the SBO rule of 10CFR 50.63 and the related guidance of RG 1.155. Internal analysis identifies D1 (Unit 1 Train A) to have the least margin with a total loading of 2560.2 kW compared to the D1 continuous operation rating of 2750 kW. Unit 2 EDGs are each rated for 5400 kW and have considerably more margin compared to Unit 1 EDGs.

Emergency Diesel Generator Testing

The monthly operability surveillances performed do not operate the EDGs independent of the grid. During these monthly runs the EDGs operate at the grid frequency which is documented in the surveillances to be between 59.5 and 60.5 Hz.

The EDGs are operated independent of the grid each refueling outage. This is documented by performance of the Integrated SI Test With a Simulated Loss of Offsite Power surveillance procedure. This surveillance demonstrates the EDGs ability to start from standby and sequentially provide power to the engineered safety features (ESF) loads of the associated safety related 4 kV bus. EDG voltage and frequency data is collected during performance of the surveillance.

Voltage is taken from the control power transformer power supplied from the generator output upstream of the generator output breaker.

Frequency is measured through the use of Lab View software. The software uses an internal frequency counter. This counter is validated by comparison with a calibrated known source prior to running the test. The surveillance results demonstrate that the EDGs operate between 59.5 and 60.5 Hz after achieving steady state.

EDG Diesel Fuel Oil Consumption

If an EDG were to operate at the upper frequency limit, the EDG load would be increased and the diesel fuel oil (DFO) consumption rate would be increased. DFO storage requirements for the PINGP safeguards diesels are specified in TS 3.7.8, "Cooling Water (CL) System", (applicable to cooling water system diesels) and TS 3.8.3, "Diesel Fuel Oil" (applicable to EDGs). These TS were also identified as non-conservative when the EDG operating frequency issue was identified. To resolve the issue of non-conservative TS for DFO storage volumes, NSPM submitted an LAR dated August 11, 2011 (ADAMS Accession No. ML112240140). This issue was resolved by NRC issuance of license amendments 207 and 194 (ML13093A344) for PINGP Units 1 and 2 respectively.

Summary of Proposed Frequency Changes

This LAR proposes to revise the TS EDG surveillance testing by increasing the lower EDG steady state frequency limit to 59.5 Hz and decreasing the upper steady state frequency limit to 60.5 Hz in TS SR 3.8.1.2, SR 3.8.1.6 and SR 3.8.1.9. The following table summarizes the changes proposed:

Description	Nominal Frequency (Hz)	Lower Frequency (Hz)	Upper Frequency (Hz)
Current TS SR 3.8.1.2, SR 3.8.1.6, SR 3.8.1.9 limits	60	58.5	61.2
Current procedure administrative limits	60	59.5	60.5
Proposed TS SR 3.8.1.2, SR 3.8.1.6, SR 3.8.1.9 limits	60	59.5	60.5

These proposed frequency limits are more restrictive than the current limits. Analyses have been performed which demonstrate that the safeguards loads which are supplied power by the EDGs will perform their safety functions when the EDGs operate within the steady state frequency limits of 59.5 Hz to 60.5 Hz. The EDGs have demonstrated their capability to operate within the frequency limits of 59.5 Hz to 60.5 Hz under loaded conditions in their surveillance tests. These proposed changes will assure that the EDGs are capable of supplying power at frequencies at which the equipment supplied by the safeguards buses will perform their required safety functions.

Conclusions

This LAR proposes to revise the TS EDG surveillance testing by increasing the lower steady state voltage limit to 4084 VAC, decrease the steady state upper voltage limit to 4400 VAC, increase the steady state lower frequency limit to 59.5 Hz and decrease the steady state upper frequency limit to 60.5 Hz in TS SR 3.8.1.2, SR 3.8.1.6 and SR 3.8.1.9. These proposed voltage and frequency limits are more restrictive than the current limits. Analyses have been performed which demonstrate that the safeguards loads which are supplied power by the EDGs will perform their safety functions when the EDGs operate within the proposed voltage and frequency limits. The EDGs have demonstrated their capability to operate within the voltage and frequency limits under loaded conditions in their surveillance tests. These proposed changes will assure that the EDGs are capable of supplying power at voltages and frequencies at which the equipment supplied by the safeguards buses will perform their required safety functions. Operation and testing of the Prairie Island Nuclear Generating Plant with the proposed TS revisions will continue to protect the health and safety of the public.

4. REGULATORY SAFETY ANALYSIS

4.1 Applicable Regulatory Requirements/Criteria

Title 10 Code of Federal Regulations 50.36, "Technical specifications":

> (c) Technical specifications will include items in the following categories:
>
> 3) *Surveillance requirements*. Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

This license amendment request proposes to revise specific required emergency diesel generator (EDG) voltages and frequencies in the applicable surveillance requirements. These are more restrictive changes and assure that the EDGs are capable of supplying power at voltages and frequencies which will operate the equipment supplied by the safeguards buses. With these changes, the Technical Specifications will continue to assure that the necessary quality of the emergency diesel generators and their components is maintained and the limiting conditions for operation of these systems will continue to be met.

Thus with the changes proposed in this license amendment request, the requirements of Title 10 CFR 50.36 continue to be met.

General Design Criteria

The construction of the Prairie Island Nuclear Generating Plant was significantly complete prior to issuance of 10 CFR 50, Appendix A, General Design Criteria. The Prairie Island Nuclear Generating Plant was designed and constructed to comply with the Atomic Energy Commission General Design Criteria as proposed on July 10, 1967, (AEC GDC) as described in the plant Updated Safety Analysis Report. AEC GDC proposed Criterion 39 provides design guidance for the operating capability of alternate power systems.

Criterion 39 - Emergency Power For Engineered Safety Features

> Alternate power systems shall be provided and designed with adequate independency, redundancy, capacity, and testability to permit the functioning required of the engineered safety features. As a minimum, the onsite power system and the offsite power system shall each, independently, provide this capacity assuming a failure of a single active component in each power system.

AEC GDC Criterion 39 is partially met at the Prairie Island Nuclear Generating Plant through the redundant source of onsite power from two emergency diesel generators installed at the plant for each unit. This license amendment request proposes to revise specific emergency diesel generator (EDG) voltages and frequencies required to satisfy Technical Specification surveillance requirements. These changes assure that the EDGs are capable of supplying power at voltages and frequencies which will operate the equipment supplied by the safeguards buses. With these changes, the AEC GDC stated above will continue to be met when the plant is operated with the plant Technical Specifications revised as proposed. Thus with the changes proposed in this license amendment request, the requirements of AEC GDC 39 continue to be met and the plant Technical Specifications will continue to provide the basis for safe plant operation.

4.2 Precedent

The NRC has reviewed and approved similar license amendments for other nuclear plants that have revised TS voltage and/or frequency limits for EDG surveillance requirements. Specifically, an example of voltage and frequency limit changes is provided by a license amendment for the Wolf Creek Generating Station (WCGS).

Wolf Creek Nuclear Operating Corporation submitted an LAR on behalf of WCGS on November 30, 2011 (ML11340A033). The purpose of the license amendment, as stated in the April 11, 2013 NRC Safety Evaluation (SE) (ML13077A147) was,

> The proposed changes would revise the TS 3.8.1, "AC [Alternating Current] Sources Operating," Surveillance Requirements (SRs) related to Diesel Generator (DG) test loads, voltage, and frequency. . . Specifically, the licensee proposes to revise the TS SRs to provide a more restrictive voltage and frequency band for DG operation when not connected in parallel with the offsite sources.

The WCGS license amendment dated April 11, 2013, approved the proposed voltage and frequency surveillance limits.

The specifics of the WCGS LAR differ from this LAR for PINGP in that a different voltage range and a different frequency range are requested; however, the purpose and effect of the WCGS LAR are the same in that more restrictive steady state surveillance testing requirements were proposed to assure the EDGs are capable of supplying power at voltages and frequencies which will operate the equipment supplied by the safeguards buses. NSPM has also performed plant-specific evaluations which support the use of the proposed steady state voltage and frequency limits.

4.3 Significant Hazards Consideration

Northern States Power Company, a Minnesota corporation (NSPM) evaluated whether or not a significant hazards consideration is involved with the proposed amendment 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 consequences of an accident previously evaluated?**

   Response: No

   This license amendment request proposes to revise specific emergency diesel generator steady states voltage and frequency limits in the Technical Specification Surveillance Requirements which are more restrictive than the current limits.

   The emergency diesel generators and the equipment on the safeguards buses supplied by the emergency diesel generators are not accident initiators, and therefore the proposed voltage and frequency limits changes do not involve an increase in the probability of an accident.

   The proposed emergency diesel generator surveillance test voltage and frequency limits assure the emergency diesel generators are capable of providing electrical power at voltages and frequencies that are adequate to operate the required equipment on the safeguards buses and thus maintain the current licensing basis for accident mitigation. Thus the proposed voltage and frequency limit changes do not involve a significant increase in the consequences of an accident.

   Therefore, the proposed Technical Specification changes do 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

   This license amendment request proposes to revise specific emergency diesel generator steady state voltage and frequency limits in the Technical Specification Surveillance Requirements which are more restrictive than the current limits.

   The proposed Technical Specification changes which revise the emergency diesel generator voltage and frequency limits do not change any system operations or maintenance activities. The changes do not involve physical alteration of the plant; that is, no new or different type of equipment will be installed. The changes do not alter assumptions made in the safety analyses but ensure that the diesel generators are capable of operating equipment as

assumed in the accident analyses. These changes do not create new failure modes or mechanisms which are not identifiable during testing and no new accident precursors are generated.

Therefore, the proposed Technical Specification changes do not create the possibility of a new or different kind of accident from any previously evaluated.

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

Response: No

This license amendment request proposes to revise specific emergency diesel generator steady state voltage and frequency limits in the Technical Specification Surveillance Requirements which are more restrictive than the current limits.

Since this license amendment proposes Technical Specification changes which further restrict the acceptable voltage and frequency limits, both upper and lower, margins of safety are increased, and no margin of safety is reduced as part of this change.

Therefore, the proposed Technical Specification changes do not involve a significant reduction in a margin of safety.

Based on the above, the Northern States Power Company, a Minnesota corporation (NSPM) 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 Conclusions

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

5. 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 effluent 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. REFERENCES

None

ENCLOSURE, ATTACHMENT 1

Technical Specification Pages (Markup)

3.8.1-6
3.8.1-8
3.8.1-9

3 pages follow

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required path.	7 days
SR 3.8.1.2	----------NOTES---------- 1. Performance of SR 3.8.1.6 satisfies this SR. 2. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 3. A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR in consideration of manufacturer's recommendations. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.6 must be met. ---------- Verify each DG starts from standby conditions and achieves steady state voltage ≥ 4084~~3740~~ V and ≤ 4400~~4580~~ V, and frequency ≥ 59.5~~58.8~~ Hz and ≤ 60.5~~61.2~~ Hz.	31 days

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.6	----------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 ≥ 3740 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 4084~~3740~~ V and ≤ 4400~~4580~~ V, and frequency ≥ 59.5~~58.8~~ Hz and ≤ 60.5~~61.2~~ Hz.	184 days
SR 3.8.1.7	Verify each DG does not trip during and following a load rejection of: 1. Unit 1 ≥ 650 kW; and 2. Unit 2 ≥ 860 kW.	24 months
SR 3.8.1.8	Verify each DG's automatic trips are bypassed on an actual or simulated safety injection signal except: a. Engine overspeed; b. Generator differential current; and c. Ground fault (Unit 1 only).	-------NOTE------ SR 3.0.2 interval extension (1.25 times the interval) applies to this SR ---------- 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.9	----------NOTES---------- 1. Momentary transients outside the load and power factor ranges do not invalidate this test. 2. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.85. 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 operates for ≥ 24 hours: a. For ≥ 2 hours loaded: Unit 1 ≥ 2832 kW, and ≤ 3000 kW Unit 2 ≥ 5400 kW, and ≤ 5940 kW; and b. For the remaining hours of the test loaded: Unit 1 ≥ 2500 kW, and Unit 2 ≥ 4860 kW; and c. Achieves steady state voltage ≥ 4084~~3740~~ V and ≤ 4400~~4580~~ V; and frequency ≥ 59.5~~58.8~~ Hz and ≤ 60.5~~61.2~~ Hz.	24 months

ENCLOSURE, ATTACHMENT 2

Technical Specification Bases (Markup)

B 3.8.1-15
B 3.8.1-16

2 pages follow

BASES

ACTIONS (continued)

G.1

Condition G corresponds to a level of degradation in which all redundancy in the AC electrical power supplies has been lost. At this severely degraded level, any further losses in the AC electrical power system may cause a loss of function. Therefore, no additional time is justified for continued operation. The unit is required by LCO 3.0.3 to commence a controlled shutdown.

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, as discussed in the USAR (Ref. 2). 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 regulatory guidance as addressed in the USAR. The voltages and frequencies discussed in these SRs are consistent with analysis described in the USAR (Ref. 2).

SR 3.8.1.2, 3.8.1.6 and 3.8.1.9 make reference to DG steady state voltage. When required to start and connect to the bus, the connection of the DG to the safeguards bus is controlled by the automatic load sequencer. The load sequencer is a programmable logic controller (PLC) which performs the following functions for its associated safeguards bus: load rejection; voltage restoration; and load restoration. The voltage restoration portion of the sequence will connect the DG to the bus if no viable offsite source is available. The load restoration is accomplished by a series of start permissives separated by 5 second steps. The 5 second steps allow for the starting of the load and voltage recovery prior to starting the next loads which ensures that voltage does not fall below the degraded voltage setting of the bus. The PLC program has the capability to have up to 9 programed load steps which total 45 seconds. Along with a 15 second allowance for the DG to start and

BASES

SURVEILLANCE REQUIREMENTS (continued)

come up to rated speed and voltage gives a total transient time of 60 seconds. After 60 seconds the DG is determined to be in a steady state condition.

SR 3.8.1.1

This SR ensures proper circuit continuity for the required 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 offsite power source, and that appropriate independence of offsite circuits is maintained. The 7 day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because its status is displayed in the control room.

SR 3.8.1.2 and SR 3.8.1.6

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. The steady state voltage requirement is to allow the DG to accept loads 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 2 for SR 3.8.1.2) 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.

In order to reduce stress and wear on diesel engines, some manufacturers recommend 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 3, which is only applicable when such modified start procedures are recommended by the manufacturer.

ENCLOSURE, ATTACHMENT 3

Technical Specification Pages (Retyped)

3.8.1-6
3.8.1-8
3.8.1-9

3 pages follow

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required path.	7 days
SR 3.8.1.2	----------NOTES---------- 1. Performance of SR 3.8.1.6 satisfies this SR. 2. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 3. A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR in consideration of manufacturer's recommendations. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.6 must be met. ---------- Verify each DG starts from standby conditions and achieves steady state voltage $\geq$ 4084 V and $\leq$ 4400 V, and frequency $\geq$ 59.5 Hz and $\leq$ 60.5 Hz.	31 days

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.6	----------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 ≥ 3740 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 4084 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	184 days
SR 3.8.1.7	Verify each DG does not trip during and following a load rejection of: 1. Unit 1 ≥ 650 kW; and 2. Unit 2 ≥ 860 kW.	24 months
SR 3.8.1.8	Verify each DG's automatic trips are bypassed on an actual or simulated safety injection signal except: a. Engine overspeed; b. Generator differential current; and c. Ground fault (Unit 1 only).	-------NOTE------ SR 3.0.2 interval extension (1.25 times the interval) applies to this SR ---------- 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.9	----------NOTES---------- 1. Momentary transients outside the load and power factor ranges do not invalidate this test. 2. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.85. 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 operates for ≥ 24 hours: a. For ≥ 2 hours loaded: Unit 1 ≥ 2832 kW, and ≤ 3000 kW Unit 2 ≥ 5400 kW, and ≤ 5940 kW; and b. For the remaining hours of the test loaded: Unit 1 ≥ 2500 kW, and Unit 2 ≥ 4860 kW; and c. Achieves steady state voltage ≥ 4084 V and ≤ 4400 V; and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	24 months