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U.S. Nuclear Regulatory Commission
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Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-53 and DPR-69
NRC Docket Nos. 50-317 and 50-318

Subject: License Amendment Request
Proposed Changes to Technical Specification (TS) 3.8.1 Emergency Diesel Generator Surveillance Requirements for Frequency and Voltage Tolerances (using WCAP-17308 methodology)

Reference: 1. WCAP-17308-NP-A, Revision 0, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances," dated July 2017

Pursuant to 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (Exelon), proposes changes to the Technical Specifications (TS), Appendix A of Operating License Nos. DPR-53 and DPR-69 for Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2, respectively.

This submittal requests changes to TS 3.8.1, "AC Sources - Operating" to revise certain frequency and voltage acceptance criteria for steady-state emergency diesel generator surveillance testing. Although a non-conservative TS was not identified, the review of the existing applicable calculations concluded low margin in several areas. The proposed changes improve the design margin in these areas.

Attachment 1 provides the evaluation of the proposed changes. Attachment 2 provides the marked-up TS pages indicating the proposed changes. Attachment 3 provides the marked-up TS Bases Pages (for information only).

There are no regulatory commitments contained within this submittal.

Exelon has concluded that the proposed changes present no significant hazards consideration under the standards set forth in 10 CFR 50.92.

Exelon requests approval of the proposed amendment by December 11, 2020. Upon NRC's approval, the amendment shall be implemented within 120 days of issuance.

The proposed changes have been reviewed by the Plant Operations Review Committee in accordance with the Exelon Quality Assurance Topical Report.

The State of Maryland is being notified of this application for changes to the Technical Specifications by transmitting a copy of this letter and its attachments to the designated State Official.

If you have any questions or require additional information, please contact Frank Mascitelli at 610-765-5512.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 11th day of December 2019.

Respectfully,

Shannon Rafferty-Czincila
Director, Licensing
Exelon Generation Company, LLC

Attachments: 1. Evaluation of Proposed Changes
2. Markup of Proposed Technical Specifications Pages
3. Markup of Proposed Technical Bases Pages (for information only)

cc: USNRC Region I, Regional Administrator
USNRC Project Manager, CCNPP
USNRC Senior Resident Inspector, CCNPP
D. A. Tancabel, State of Maryland

ATTACHMENT 1
License Amendment Request

Calvert Cliffs Nuclear Power Plant, Units 1 and 2

Docket Nos. 50-317 and 50-318

EVALUATION OF PROPOSED CHANGES

Subject: License Amendment Request
Proposed Changes to Technical Specification (TS) 3.8.1 Emergency Diesel Generator Surveillance Requirements for Frequency and Voltage Tolerances (using WCAP-17308 methodology)

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1.0 DESCRIPTION

Pursuant to 10 CFR 50.90, “Application for amendment of license or construction permit," Exelon Generation Company, LLC (Exelon), proposes changes to the Technical Specifications (TS), Appendix A of Operating License Nos. DPR-53 and DPR-69 for Calvert Cliffs Nuclear Power Plant (CCNPP), Units 1 and 2, respectively.

This submittal requests changes to TS 3.8.1, "AC Sources - Operating" to revise certain voltage and frequency acceptance criteria for steady-state standby diesel generator surveillance requirements. Although a non-conservative TS was not identified, the review of the existing applicable calculations concluded low margin in several areas. The applicable calculations were revised per WCAP-17308, “Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances,” (Reference 1) methodology to gain additional margin.

The emergency power sources are designed to furnish onsite power (upon a loss of normal supplies of power) to reliably shut down the plant and maintain it in a safe shutdown condition under all conditions, including accidents. The emergency power sources are part of the Emergency Safeguards Features (ESF) electrical system and are designed as Class 1E systems. The diesel generator sets selected for use as standby power supplies have the capability to: (1) power the ESF in rapid succession, and (2) supply continuously the sum of the loads needed to be powered at any one time.

The Emergency Diesel Generators (EDGs) are designed to provide a dependable onsite power source capable of starting and supplying the essential loads necessary to safely shut down the plant and maintain it in a safe shutdown condition under all conditions. Four safety-related EDGs are provided for the plant although each Unit requires only one EDG to supply the minimum power requirements for its ESF equipment.

If one of the two EDGs (per Unit) should fail to start or carry load, the system continues to provide an electrically independent channel of emergency power to the Unit. Reliability is increased by the adoption of the two-channel concept, i.e., independent electrical controls and sources supply redundant AC and DC ESF equipment.

The EDGs are designed to reach rated speed and voltage and to start accepting load within 10 seconds after the receipt of a starting signal. The diesel generators and their auxiliaries are designed to withstand Seismic Category I accelerations and are installed within Seismic Category I structures.

Three of the four EDGs consist of 4.16 kV, three-phase, 60-cycle Fairbanks Morse diesel generators with nominal continuous ratings given below. All generator sets are physically separated and electrically isolated from each other.

The three Fairbanks Morse diesel generators have been upgraded and are rated as follows:

3000 kW	Continuous	(consumes approximately 3.87 gpm fuel oil)
3300 kW	2000 hour	
3500 kW	200 hour	(consumes approximately 4.454 gpm fuel oil)
3600 kW	30 minutes	

At no time during the loading sequence will the frequency and voltage decrease to less than 95% of normal and 75% of normal, respectively. During recovery from transients caused by step load increases or resulting from the disconnection of the largest single load, the speed of the diesel generator will not exceed nominal speed plus 75% of the difference between nominal speed (900 RPM) and 115% of nominal speed. Voltage is restored to within 10% of nominal in less than 40% of each load sequence time interval. Frequency is restored to within 2% of nominal in less than 60% of each load sequence time interval. The nominal values of speed, voltage and frequency are defined in the Technical Specifications.

One of the four emergency power sources is the 4.16 kV, three-phase, 60-cycle tandem-engine Societe Alsacienne De Constructions Mecaniques De Mulhouse (SACM) diesel generator which has a nominal continuous rating of 5400 kW. The generator set for the SACM diesel, like those for the Fairbanks Morse diesel generators is physically separated and electrically isolated from the other generator sets.

The SACM diesel is rated as follows:

5400 kW	Continuous (consumes approximately 4.75 gpm fuel oil)
5940 kW	2 hour
1620 kW	Minimum continuous load (Diesel may be operated at lower load for up to 7 days)

During loading of the safety-related SACM diesel generator, the frequency and voltage at the diesel generator terminals will not decrease to less than 95% and 82%, respectively. The diesel generator has the capability of starting the largest single motor with all other sequenced loads running. During recovery from transients caused by step loading or disconnection of full load, the safety-related SACM diesel generator's speed will not exceed 75% of the difference between nominal (1200 rpm) and the overspeed trip setpoint or 15% above nominal speed, whichever is lower.

For all four EDGs, in accordance with the recommendations of Regulatory Guide 1.9, Revision 3, (Reference 2) frequency is restored to within 2% of nominal within 60% of each load sequence time interval, and voltage is restored to within 10% of nominal within 60% of each load sequence time interval.

2.0 DETAILED DESCRIPTION

2.1 Reason for the proposed change

For the events that assume offsite power is lost, the EDGs provide power to safety related pumps, motor operated valves (MOVs), and fans/blowers. Historically, the EDG frequency and voltage tolerances associated with the governor and voltage regulator are not considered in the steady-state evaluation of these components. The analyses of these components typically assume that the steady-state EDG frequency is 60 Hz and voltage is 4,160 V after the EDG starting and loading transients. However, the CCNPP TS contain Surveillance Requirements (SRs) that place limits on the EDG frequency and voltage ranges during start up and loading transients.

The current TS tolerances of maintaining voltage greater than 4060 V and less than 4400 V and frequency greater than 58.8 Hz and less than 61.2 Hz were intended to apply to EDG starting and loading transients and was not intended to apply to steady-state operation as discussed in U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.9. However, since the wording of the TS SRs would allow steady-state EDG operation within those limits, the NRC has raised the issue during Component Design Basis Inspections (CDBIs) at several plants as to whether the impacts of the allowable tolerances in EDG frequency and voltage have been evaluated with respect to performance of the affected equipment.

Westinghouse prepared WCAP-17308 to address these issues. WCAP-17308 identified the following components which would be affected by steady-state EDG operation at the extremes of the frequency and voltage limits:

- Pump performance
- EDG loading
- EDG fuel oil consumption
- Motor-operated valve performance
- Heating, ventilation and air conditioning (HVAC) fan/blower performance

WCAP-17308 recommended revising the TS to reduce the allowable EDG frequency and voltage variation during steady state operation through a license amendment and performing the required engineering activities to address the impact of EDG frequency and voltage variation on the components listed above.

In April 2017, the NRC issued their final Safety Evaluation Report (SER) endorsing the methodology in WCAP-17308 for demonstrating adequacy of Emergency Core Cooling Systems (ECCS) used to mitigate the consequences of an accident when the onsite sources (EDGs) are operating at the extremes of allowable frequency and voltage.

Exelon has revised the affected EDG frequency and voltage calculations using the WCAP-17308 methodology and found the need to reduce the TS tolerance bands to ensure sufficient design margin under all postulated accident scenarios. As a result, the EDG frequency and voltage tolerances have been selected to minimize impacts to safety-related pumps, fans, and motor-operated valves (MOVs) without challenging the availability of the EDGs. A frequency tolerance of 60 Hz ± 0.75 Hz and a voltage tolerance of 4060 V to 4310 V have been selected to ensure minimum operability issues with safety-related pumps, fans, and MOVs.

2.2 Current Technical Specifications requirements

CCNPP TS have four SRs that specify EDG steady-state frequency and voltage acceptance criteria with uncertainty ranges:

Surveillance Requirement	Description	Frequency (from current SFCP*)
SR 3.8.1.3	Verify each DG starts and achieves steady state voltage ≥ 4060 V and ≤ 4400 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	31 days
SR 3.8.1.9	Verify each DG starts from standby condition and achieves, in ≤ 10 seconds, voltage > 4060 V and frequency > 58.8 Hz, and after steady state conditions are reached, maintains voltage ≥ 4060 V and ≤ 4400 V and frequency of > 58.8 Hz and ≤ 61.2 Hz.	184 days
SR 3.8.1.11	Verify each DG, operating at a frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and an appropriate accident load power factor operates for ≥ 4 hours while loaded to ≥ 4000 kW for DG 1A and ≥ 3000 kW for DGs 1B, 2A, and 2B.	24 months
SR 3.8.1.15	Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated Engineered Safety Feature actuation signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through load sequencer, 3. maintains steady state voltage ≥ 4060 V and ≤ 4400 V, 4. maintains steady state frequency of ≥ 58.8 Hz and ≤ 61.2 Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	48 months on a staggered test basis

* Surveillance Frequency Control Program (SFCP)

2.3 Description of the proposed change

A frequency tolerance of 60 Hz ±0.75Hz and a voltage tolerance of 4060V to 4310V have been selected to ensure minimum operability issues with safety-related pumps, fans, and MOVs. The proposed changes are identified in red italics in below table:

Surveillance Requirement	Description	Frequency (from current SFCP*)
SR 3.8.1.3	Verify each DG starts and achieves steady state voltage ≥ 4060 V and ≤ *4310* V, and frequency ≥ *59.25* Hz and ≤ *60.75* Hz.	31 days
SR 3.8.1.9	Verify each DG starts from standby condition and achieves, in ≤ 10 seconds, voltage > 4060 V and frequency > 58.8 Hz, and after steady state conditions are reached, maintains voltage ≥ 4060 V and ≤ *4310* V and frequency of ≥ *59.25* Hz and ≤ *60.75* Hz.	184 days
SR 3.8.1.11	Verify each DG, operating at a frequency ≥ *59.25* Hz and ≤ *60.75* Hz, and an appropriate accident load power factor operates for ≥ 4 hours while loaded to ≥ 4000 kW for DG 1A and ≥ 3000 kW for DGs 1B, 2A, and 2B.	24 months
SR 3.8.1.15	Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated Engineered Safety Feature actuation signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through load sequencer, 3. maintains steady state voltage ≥ 4060 V and ≤ *4310* V, 4. maintains steady state frequency of ≥ *59.25* Hz and ≤ *60.75* Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	48 months on a staggered test basis

* Surveillance Frequency Control Program (SFCP)

A detailed markup of the TS has been included in Attachment 2. A markup of the associated TS Bases is attached for information only and included in Attachment 3.

3.0 TECHNICAL EVALUATION

3.1 WCAP 17308 Methodology Implementation

The WCAP-17308-NP-A Revision 0 methodology was used in reassessing the existing SR acceptance criteria for EDG frequency and voltage uncertainties. The evaluation consisted of two phases. The Diesel Generator Loading Calculation (Reference 4) was reviewed to determine the scope of components which are required to be evaluated per WCAP-17308.

A phased approach was used to complete this evaluation. A summary of the phases is provided below:

Phase 1:

The scope of this phase was to perform an evaluation of Calvert Cliffs' EDG loads required for a Loss of Offsite Power (LOOP). The purpose of the evaluation was to determine the scope of existing equipment reviews that were required to account for the EDG frequency and voltage tolerances. This evaluation and report, SL-014205 (Reference 3) included the following activities:

- Component Identification – Review the plant EDG loading calculations to identify the pumps, MOVs, and fans/blowers that screen into the scope of the Phase 2 evaluation.
- Fuel Oil Consumption – Review the existing fuel oil consumption calculation to determine whether the current methodology bounds any impacts of EDG tolerances.
- Pumps – Review the IST program basis for a sample of three (3) pumps to determine what parameters went into developing the IST acceptance curves. Review four (4) design calculations to determine methodology for sizing pumps with respect to design flow and Technical Specification analytical limits. Based on the results of the review, a methodology will be developed for the Phase 2 evaluations.
- Fans – Review the available documentation for a sample size of five (5) fans to determine what level of detail will be required to perform the EDG tolerance evaluations and develop a methodology for performing the Phase 2 evaluations.
- Motor Operated Valves – Review design and test data for a sample size of five (5) valves to determine the effort and methodology and scope for completing Phase 2 evaluations for MOVs.

The output of Phase 1 became the roadmap for EDG frequency and tolerance resolution in accordance with WCAP-17308 in Phase 2.

Phase 2:

The scope of Phase 2 was to perform the calculations necessary to evaluate the impact of EDG frequency and voltage tolerance on the TS design bases for all the equipment identified under Phase 1. This evaluation determined a recommended TS limit on EDG voltage and frequency tolerance that had a minimal impact on EDG powered components (i.e., pumps, MOVs, fans) while also not impacting EDG availability. Calculation CA10309, "Evaluation of Fans, Pumps, and MOVs for the Effects of Emergency Diesel Generator Voltage and Frequency Variations (Reference 5) was prepared during Phase 2.

Calculation CA10309 evaluated all safety-related motors, fans, pumps and MOVs that were identified as impacted during Phase 1. Based on the evaluation, it was determined that the EDG TS frequency tolerance should be reduced to 60 ± 0.75 Hz. The TS EDG voltage minimum tolerance will remain at 4060 V and the maximum voltage tolerance should be reduced to 4310 V. The results are summarized in Appendices to CA10309:

Appendix A – Motor Speeds
Appendix B – Fans
Appendix C – Pumps
Appendix D - MOVs

3.2 Impact on Safety Related Functions

The CA10309 results are summarized below for safety related equipment:

Motor Speeds (Appendix A):

Appendix A calculated the motor speeds for all fans and pumps evaluated in Appendices B and C, respectively, when operating outside of rated values. Appendix A, in conjunction with Appendices B and C, also determined the EDG frequency and voltage tolerances to ensure minimum equipment operability issues.

Based on the conclusions of Appendix A and through an iterative process of calculations in Appendices B, C, and D, the new proposed TS EDG frequency and voltage tolerances are respectively:

60 Hz +/- 0.75 Hz
4060 V to 4310 V

A review of past EDG performance from SR history from 1992 to 2018, as documented in Table 4 of CA10309's Appendix A, was conducted to ensure reasonableness of the above selected ranges. The review indicated that the highest steady-state EDG frequency recorded during testing was 60.75 Hz for EDG 1A. Based on the recorded EDG frequencies, the vast majority of recorded frequencies are well within 0.3 Hz of nominal for each EDG. Regarding the lowest steady state voltage limit, SR history indicated that the lowest steady-state EDG voltage recorded during testing was 4076 V for EDG 1A in 2010. Regarding the highest steady-state voltage limit, SR history indicated that the highest steady-state EDG voltage recorded was 4350 V for EDG 2A in 1995. This was the only event in a 26-year history that exceeded the new proposed limit and was judged not likely to be repeated.

In summary, it has been shown that there are instances where the recorded voltage and frequency values are at or near the proposed new EDG voltage and frequency tolerances. However, more recent test history demonstrates that the EDGs consistently run near their nominal setpoints and are within the proposed voltage and frequency limits. Therefore, the proposed voltage and frequency tolerances are acceptable.

Fans (Appendix B):

Appendix B evaluated the impact on airflow produced by the EDG-powered fans while the EDG is operated at minimum voltage and frequency. The evaluation determined that the fans evaluated had airflows reduced by -1.45% to - 2.32% as a result of the motor speed reduction. This is a small change in airflow which will not impact the design function of the fans. Airflows for fans operating with motor speeds above rated are not evaluated, as an increase in motor speed will result in increased airflows and thus better fan performance.

Pumps (Appendix C)

Appendix C of this calculation evaluated all EDG-powered pumps in accordance with WCAP-17308. The evaluation determined new In-Service Test (IST) limits for all pumps based on the methodology specified in WCAP-17308. These new IST limits were compared to existing limits to determine any required changes to existing IST limits. A summary of these changes was provided in the Conclusions section of Appendix C. Based on a review of recent IST data, all pumps are expected to operate within the new IST limits.

Motor Operated Valves (Appendix D)

Appendix D evaluated all EDG-powered MOVs in accordance with WCAP-17308. The evaluation determined that all EDG-powered MOVs remain within the acceptable limits. Additionally, this evaluation compares the EDG factors for increased torque and thrust and concludes that these factors are bounded by the 5% engineering safety factor applied in the MOV Integrated Data Acquisition System (MIDAS) calculations. MIDAS is MOV Software used to implement the engineering design and margin management for safety related MOVs included in the Appendix III or OMN-1 MOV Program. As such, the EDG impacts are bounded by the existing safety factor and no changes are required to the MIDAS calculations or test limits.

To summarize: Calculation CA10309 performed the evaluations of all fans, pumps, and MOVs identified as impacted under SL-014205. Based on the results of this evaluation, all components have been shown to be operable across the full range of the proposed EDG frequency and voltage tolerances.

3.3 Impact on EDG Loading

The Design Analysis E-88-015, "Diesel Generator Loading Calculation," (Reference 4) determined the load on the EDGs. During the WCAP-17308 evaluation, inductive loads operating above their rated 60 Hz resulted in an increased load on the EDG. As such, a major revision was made to Design Analysis E-88-015 to incorporate the revised EDG maximum allowable frequency. The result of the major revision to Design Analysis E-88-015 showed that the loading remained within the ratings of the EDGs and TS limits as summarized in Table 1 below:

Table 1 - Highest Predicted EDG Loading @ 60.75 Hz, 4060 V

EDG	TS Limit (kW)	Highest Predicted (kW)	Margin to Limit	Comparison to kW @ 60 Hz, 4160 V
1A (SACM)	4000	3599.6	10.0%	3523.3 (11.9%)
1B, 2A, 2B	3000	2944.4	1.9%	2853.7 (4.9 %)

3.4 Impact on EDG Fuel Oil Consumption Calculations

Report SL-014205 identified impacts to the diesel fuel oil consumption calculations. However, the results of the revision to Design Analysis E-88-015 showed that the EDGs still operated within their ratings at increased frequency and voltage. The existing fuel oil consumption calculations, CA00067 (Reference 6) and D-M-92-010 (Reference 7) which evaluated fuel oil consumption rates and minimum required volumes are based on the continuous ratings of the EDGs.

The diesel fuel oil consumption calculations CA00067 and D-M-92-010 determined the fuel oil consumption rate and minimum tank level requirements based on the maximum KW output of the diesel generators. For the Fairbanks Morse diesel generators, this corresponds to a rating of 3000 KW. For the SACM diesel generators, this corresponds to a rating of 5400 KW. The revision to the Design Analysis E-88-015 determined that, at the increased frequency, both the Fairbanks Morse and the SACM generators continue to operate within their KW ratings. As such, the results of fuel oil consumption calculations CA00067 and D-M-92-010 remain bounding, and therefore, no changes were required.

3.5 Impact on MOV Performance

Motor Operated Valve (MOV) Program Impact

Motor operated valves were evaluated in Appendix D to CA10309. WCAP-17308 determined that there were four potential effects on MOVs due to EDG frequency and voltage tolerance that need evaluation. The first consideration is the increased inertia of the motor due to increased EDG frequency. The second is the potential effect of higher pump motor frequency on the differential pressure across the MOVs. The third is the impact of decreased voltage below nominal on the motor operator capability. The fourth is increased stroke time. Appendix D to CA10309 evaluated all safety-related, EDG-powered MOVs and determined that no issues exist at the proposed new TS SR frequency and voltage uncertainty values.

4.0 REGULATORY ANALYSIS

4.1 Applicable Regulatory Requirements/Criteria

CCNPP was not licensed to the 10 CFR 50, Appendix A, General Design Criteria (GDC). The CCNPP equivalent of the referenced GDC is provided in Appendix 1C of the Updated Final Safety Analysis Report (UFSAR). This Section of the CCNPP UFSAR provides an analysis of plant design criteria for CCNPP to the GDC criteria. Based on the analysis

performed, Exelon believes that the plant-specific requirements for CCNPP are sufficiently similar to the Appendix A, GDC and represent an adequate technical basis for adopting the proposed change.

The proposed changes have been evaluated to determine whether applicable regulations and requirements continue to be met. Exelon has determined that the proposed changes do not require any exemptions or relief from regulatory requirements from the following current applicable regulations and regulatory requirements, which were reviewed in making this determination:

10 CFR 50.36 - Technical specifications

Per 10 CFR 50.36(c)(3) TS includes SRs 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. The proposed changes involve the frequency and voltage uncertainty acceptance bands for four EDG SRs. In addition,10 CFR 50.36 requires that a licensee's TS be derived from the analyses and evaluation included in the safety analysis report. The proposed changes are based on revised analysis and calculations performed in accordance with the WCAP-17308 methodology, which has been approved by NRC in a Safety Evaluation Report dated April 17, 2017. The proposed changes do not affect CCNPP’s compliance with the intent of 10 CFR 50.36.

10 CFR 50.46 - Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors

The regulation at 10 CFR 50.46(a)(1)(i) requires, in part, that nuclear power plants "must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in this section. ECCS cooling performance must be calculated in accordance with an acceptable evaluation model and must be calculated for a number of postulated loss-of-coolant accidents of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated loss-of-coolant accidents are calculated .... Comparisons to applicable experimental data must be made and uncertainties in the analysis method and inputs must be identified and assessed so that the uncertainty in the calculated results can be estimated. The proposed changes do not affect CCNPP’s compliance with the intent of 10 CFR 50.46.

General Design Criterion (GDC) 17 - Electric Power Systems

GDC 17 requires an onsite electric power system and an offsite electric power system shall be provided to permit the functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. The proposed changes do not affect CCNPP’s compliance with the intent of GDC 17.

GDC 18 - Inspection and testing of electrical power systems

GDC 18 requires that electric power systems that are important to safety must be designed to permit appropriate periodic inspection and testing of important areas and features, such as insulation and connections to assess the continuity of the systems and the condition of their components. The proposed changes do not affect CCNPP's compliance with the intent of GDC 18.

GDC 34 - Residual heat removal

GDC 34 requires that a system to remove residual heat shall be provided. The system safety function shall be to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded. The GDC requires, in part, that "capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) ... the system safety function can be accomplished, assuming a single failure." The proposed changes do not affect CCNPP compliance with the intent of GDC 34.

GDC 37 - "Testing of Emergency Core Cooling System"

GDC 37 requires that the ECCS shall be designed to permit appropriate periodic pressure and functional testing to assure: (1) the structural and leak tight integrity of its components, (2) the operability and performance of the active components of the system, and (3) the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation, including operation of applicable portions of the protection system, the transfer between normal and emergency power sources, and the operation of the associated cooling water system. The proposed changes do not affect CCNPP's compliance with the intent of GDC 37.

Regulatory Guide 1.9, Revision 3, July 1993 - Selection, Design, and Qualifications of Diesel Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants

RG 1.9 Revision 3 states, in part, that an emergency diesel generator unit selected for use in an onsite electric power system should have the capability to (1) start and accelerate a number of large motor loads in rapid succession while maintaining voltage and frequency within acceptable limits, (2) provide power promptly to engineered safety features if a loss of offsite power and an accident occur during the same time period, and (3) supply power continuously to the equipment needed to maintain the plant in a safe condition if an extended loss of offsite power occurs. The proposed changes do not affect CCNPP's compliance with the guidance in RG.1.9.

Westinghouse Electric Company LLC Report WCAP-17308-NP-A - "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances," Revision O (ADAMS Accession No. ML 17215A230).

The calculations associated with supporting the steady state EDG voltage and frequency TS SR acceptance uncertainties were revised in accordance with WCAP-17308-NP-A methodology.

4.2 Precedent

The following precedent is applicable to this proposed submittal:

South Texas Project (STP) Units 1 and 2 recently received a similar TS amendment using WCAP-17308 methodology. STP tightened both their frequency and voltage SR acceptance bands. Reference: South Texas Project, Units 1 and 2 - Issuance of Amendment Nos. 216 and 202 Re: Standby Diesel Generator Surveillance Requirements (EPID L-2018-LLA-0078), dated August 20, 2019 (ML19213A147)

4.3 No Significant Hazards Consideration

Exelon has concluded that the proposed changes to the Calvert Cliffs Nuclear Power Plant (CCNPP), Unit 1 and Unit 2, Technical Specifications (TS) Surveillance Requirements (SRs), for Emergency Diesel Generators (EDGs) to narrow the acceptable steady-state frequency and voltage uncertainty bands from a frequency of greater than or equal to 58.8 Hz and less than or equal to 61.2 Hz to greater than or equal to 59.25 Hz and less than or equal to 60.75 Hz, and from a voltage of greater than or equal to 4060 V and less than or equal to 4400 V to greater than or equal to 4060 V and less than or equal to 4310 V do not involve a Significant Hazards Consideration. The tighter SR EDG steady-state voltage and frequency uncertainty acceptance bands will improve design margins for the EDG safety related loads. In support of this determination, an evaluation of each of the three (3) standards, set forth in 10 CFR 50.92, "Issuance of amendment," is provided below.

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

Response: No.

The EDGs are not initiators for any accidents evaluated in the Updated Final Safety Analysis Report (UFSAR). The proposed changes provide a more conservative range of acceptable EDG frequency and voltage values for certain surveillance requirements (SRs). Thus, TS SRs will continue to demonstrate sufficient margin such that mitigation of accidents evaluated in the UFSAR is not impacted. The proposed changes do not alter the design function of the EDGs, nor do they affect how the EDGs are operated or physically tested.

Therefore, the proposed changes do not involve an increase in the probability or consequences of an accident previously evaluated.

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

Response: No.

The proposed changes do not involve any physical alterations and no new or different types of equipment are being installed. Requiring a more conservative range of acceptable EDG voltage and frequency SR acceptance values does not affect EDG operation and does not affect the ability of the EDGs to perform their design function. There are no new credible failure

mechanisms, malfunctions, or accident initiators introduced as a result of the proposed changes.

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

3. Do the proposed changes involve a significant reduction in a margin of safety?

Response: No.

Since the proposed changes provide a more conservative range of acceptable EDG voltage and frequency values, the margin of safety is maintained. Where required, TS SR acceptance criteria have been procedurally adjusted to ensure equipment performance meets accident analysis assumptions considering uncertainties in steady-state operation of EDGs for voltage and frequency. Exelon has evaluated the effects of EDG voltage and frequency variations on affected equipment and confirmed that the design basis analyses are not adversely affected.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety. Based on the above, Exelon concludes that the proposed amendment presents no 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

There are no changes being proposed in this amendment application such that commitments to the regulatory requirements and guidance documents above would come into question. The evaluations documented above confirm that CCNPP will continue to comply with all applicable regulatory requirements.

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 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.

6.0 REFERENCES

1. Westinghouse prepared WCAP-17308-NP-A Revision 0, “Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances,” dated July 2017 (ML17215A232)

2. 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," dated July 1993

3. Exelon Report SL-014205, "Calvert Cliffs Nuclear Power Plant Emergency Diesel Generator Frequency and Voltage Tolerance Resolution," approved April 30, 2019

4. Exelon Design Analysis No. E-88-015, "Diesel Generator Loading Calculation, Revision 6, dated April 30, 2019.

5. Exelon Calculation CA10309, "Evaluation of Fans, Pumps, and MOVs for the Effects of Emergency Diesel Generator Voltage and Frequency Variations," (ECP-17-000691-MU-02), approved on July 11, 2019.

6. Exelon Calculation CA00067, Revision 0, "Diesel Fuel Oil Calculation"

7. Exelon Calculation D-M-92-010, Revision 5, "Sizing the Fuel Oil Storage Tank"

ATTACHMENT 2

License Amendment Request

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Docket Nos. 50-317 and 50-318

Proposed Changes to Technical Specification (TS) 3.8.1 Emergency Diesel Generator Surveillance Requirements for Frequency and Voltage Tolerances (using WCAP-17308 methodology)

Markup of Proposed Technical Specifications Page

Unit 1 and 2 TS Page

3.8.1-13
3.8.1-15
3.8.1-16
3.8.1-18

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.3	----------NOTES ---------- 1. Performance of SR 3.8.1.9 satisfies this Surveillance Requirement. 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 Surveillance Requirement as recommended by the manufacturer. When modified start procedures are not used, the voltage and frequency tolerances of SR 3.8.1.9 must be met. ----------	
	Verify each DG starts and achieves steady state voltage ≥ 4060 V and ≤ ~~4400~~ V, and frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz.	In accordance with the Surveillance Frequency Control Program

59.25

4310

60.75

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.7	Verify the fuel oil transfer system operates to automatically transfer fuel oil from storage tank[s] to the day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.8	Verify interval between each sequenced load block is within ± 10% of design interval for each emergency and shutdown load sequencer.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.9	---------- NOTE ---------- All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts from standby condition and achieves, in ≤ 10 seconds, voltage > 4060 V and frequency > 58.8 Hz, and after steady state conditions are reached, maintains voltage ≥ 4060 V and ≤ ~~4400~~ V and frequency of ~~>~~ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.10	Verify manual transfer of AC power sources from the normal offsite circuit to the alternate offsite circuit.	In accordance with the Surveillance Frequency Control Program

≥ 59.25 60.75 4310

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	---------- NOTE ---------- 1. Momentary transients outside the load and power factor limits do not invalidate this test. 2. If performed with the DG synchronized with offsite power, the surveillance test shall be performed at the required power factor. 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, operating at a frequency ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz, and an appropriate accident load power factor operates for ≥ 4 hours while loaded to ≥ 4000 kW for DG 1A and ≥ 3000 kW for DGs 1B, 2A, and 2B.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.12	Verify each DG rejects a load ≥ 500 hp without tripping.	In accordance with the Surveillance Frequency Control Program

59.25

60.75

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.8.1.15 ---------- NOTE ---------- All DG starts may be preceded by an engine prelube period. ---------- Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated Engineered Safety Feature actuation signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through load sequencer, 3. maintains steady state voltage ≥ 4060 V and ≤ ~~4400~~ V, 4. maintains steady state frequency of ≥ ~~58.8~~ Hz and ≤ ~~61.2~~ Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

ATTACHMENT 3

License Amendment Request

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Docket Nos. 50-317 and 50-318

Proposed Changes to Technical Specification (TS) 3.8.1 Emergency Diesel Generator Surveillance Requirements for Frequency and Voltage Tolerances (using WCAP-17308 methodology)

Mark-up of Proposed TS Bases Changes (For Information Only)

B 3.8.1-22
B 3.8.1-24
B 3.8.1-28
B 3.8.1-30
B 3.8.1-33

allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

K.1

Condition K corresponds to a level of degradation in which all redundancy in LCO 3.8.1.a and LCO 3.8.1.b AC electrical power supplies has been lost. At this severely degraded level, any further losses in the AC electrical power system will 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, in accordance with Reference 1, GDC 18. 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 consistent with the recommendations of Reference 3, or Reference 4, and Reference 8.

~~When the SRs discussed herein specify voltage and frequency tolerances, the following is applicable. The minimum transient output voltage of 3740 V is 90% of the nominal 4160 V output voltage. This value allows for voltage drop to the terminals of 4000 V motors whose minimum operating voltage is specified as 90% or 3600 V. The specified maximum output voltage of 4400 V is equal to the maximum operating voltage specified for 4000 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 V 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 the recommendations given in Reference 3.~~

The SRs are modified by a Note which states that SR 3.8.1.1 through SR 3.8.1.15 are applicable to LCO 3.8.1.a and LCO 3.8.1.b AC Sources. The Note also states that SR 3.8.1.16 is applicable to LCO 3.8.1.c AC sources. This

In order to reduce stress and mechanical wear on diesel engines, the DG 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. This is the intent of Note 3, which is only applicable when such modified start procedures are recommended by the manufacturer.

Surveillance Requirement 3.8.1.9 requires that the DG starts from standby conditions and achieves required voltage and frequency within 10 seconds. The minimum voltage and frequency stated in the SR are those necessary to ensure the DG can accept DBA loading while maintaining acceptable voltage and frequency levels. The 10 second start requirement supports the assumptions of the design basis loss of coolant accident analysis in Reference 2, Chapter 14. Insert 1

Insert 2

Since SR 3.8.1.9 requires a 10 second start, it is more restrictive than SR 3.8.1.3, and it may be performed in lieu of SR 3.8.1.3.

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

SR 3.8.1.4

This SR verifies that the DGs are capable of synchronizing with the offsite electrical system and accepting loads greater than or equal to 4000 kW for No. 1A DG and greater than or equal to 90% of the continuous duty rating for the remaining DGs. The 90% minimum load limit is consistent with Reference 3 and is acceptable because testing of these DGs at post-accident load values is performed by SR 3.8.1.11. A minimum run time of 60 minutes is required to stabilize engine temperatures, while minimizing the time that the DG is connected to the offsite source.

Although no power factor requirements are established by this SR, the DG is normally operated at a power factor between 0.8 lagging and 1.0. The 0.8 value is the design rating of the machine, while 1.0 is an operational

certain conditions, however, Note 2 allows the surveillance to be conducted at a power factor other than ≤ 0.84 for No. 1A DG and ≤ 0.83 for Nos. 1B, 2A, and 2B DGs. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.84 for No. 1A DG and ≤ 0.83 for Nos. 1B, 2A, and 2B DGs results in voltages on the emergency busses that are too high. Conditions can also occur that could result in emergency bus voltages which are too low. Under these conditions, the power factor shall be maintained as close a practicable to 0.84 for No. 1A DG and 0.83 for Nos. 1B, 2A, and 2B DGs while maintaining acceptable voltages on the emergency busses.

Insert 3

The Surveillance Frequency is controlled under

the Surveillance Frequency Control Program.

SR 3.8.1.12

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 SR demonstrates the DG load response characteristics. This SR is accomplished by 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.

Consistent with References 10, 3, and 4, 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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.13

This SR demonstrates that DG non-critical protective functions are bypassed on a required actuation signal. This SR is accomplished by verifying the bypass contact changes to the correct state which prevents actuation of the non-

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

It is not necessary to energize loads which are dependent on temperature to load (i.e., heat tracing, switchgear HVAC compressor, computer room HVAC compressor). Also, it is acceptable to transfer the instrument AC bus to the non tested train to maintain safe operation of the plant during testing. Loads (both permanent and auto connect) < 15 kW do not require loading onto the diesel since these are insignificant loads for the DG.

Permanently- and auto-connected loads to the emergency diesel generators are defined as follows:

Permanently-Connected Load – Equipment that is not shed by an undervoltage or safety injection actuation signal and is normally operating, i.e., loads that are manually started, selected, or process signal controlled are not considered permanently-connected loads.

Auto-Connected Loads – Emergency equipment required for mitigating the events described in UFSAR Chapter 14 that are energized by loss-of-coolant incident sequencer actions after step zero and within the first minute of emergency diesel generator operation after the initiation of an undervoltage signal.

Insert 4

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

This SR is modified by a Note. The reason for the Note is to minimize mechanical wear and stress on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations for DGs.

8. Regulatory Guide 1.137, Revision 1, "Fuel-Oil Systems for Standby Diesel Generators," October 1979

9. Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. C. H. Cruse (BGE), dated April 2, 1996, Issuance of Amendments for Calvert Cliffs Nuclear Power Plant, Unit 1 (TAC No. M94030) and Unit 2 (TAC No. M94031)

10. IEEE Standard 308-1991, "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations"

11. NO-1-117, Integrated Risk Management

12. ANSI N195-1976, "Fuel Oil Systems for Standby Diesel-Generators," April 1976, Section 5.4

13. Regulatory Guide 1.9, Revision 4, "Application and Testing of Safety Related Diesel Generators in Nuclear Power Plants," March 2007

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

TS Bases Inserts

Insert 1

SR 3.8.1.9 is consistent with the guidance for this SR contained in Section 2.2.3, “Fast Start Test,” of Regulatory Guide 1.9 (Reference 3), which requires verification that the Diesel Generator “reaches required voltage and frequency within acceptable limits and time as defined in the plant technical specifications.”

Insert 2

The criteria that in ≤ 10 seconds the DG achieves > 4060 V and > 58.8 Hz when the DG is started from a standby condition are starting and accelerating design criteria for the DG that are specified to confirm the capability of the DG to recover from a loading transient. The -10% for voltage and the -2% for frequency are consistent with the guidance provided in Paragraph 1.4, of Regulatory Guide 1.9 (Ref. 3). SR 3.8.1.3 and SR 3.8.1.9 also demonstrate that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band (≥ 4060 V and ≤ 4310 V and 60 Hz +/- 0.75 Hz) placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Reference 14) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and
- Ventilation fans credited in the dose analyses.

Insert 3

SR 3.8.1.11 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band (≥ 4060 V and ≤ 4310 V and 60 Hz +/- 0.75 Hz) placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Reference 14) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,

- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and
- Ventilation fans credited in the dose analyses.

Insert 4

SR 3.8.1.15 also demonstrates that the DG can achieve steady state voltage and frequency within the specified band around the nominal values of 4160 V and 60 Hz. The band (≥ 4060 V and ≤ 4310 V and 60 Hz +/- 0.75 Hz) placed around these nominal values is based on the capability of the voltage regulator and governor. WCAP-17308-NP-A (Reference 14) contains the methodology for evaluating the impact of variations in voltage and frequency, due to the voltage regulator and governor, on the following:

- Pump flow and developed head to meet design basis requirements,
- DG loading calculations,
- DG fuel consumption calculations,
- Motor Operated Valve (MOV) performance, and
- Ventilation fans credited in the dose analyses.