



# **Comanche Peak Pre-Submittal Meeting with NRC for Proposed License Amendment Request (LAR) 15-001 TS 3.8.1, AC Sources -- Operating**

Change to Emergency Diesel Generator Surveillance Requirement  
Acceptance Criteria regarding Steady State Voltage and Frequency



# **Agenda**

- Purpose of Meeting
- AC Sources - System Overview
- Reason for Technical Specification Change
- Description of Proposed Change
- Precedent
- Technical Evaluation
  - NRC Regulatory Guidance
  - Comanche Peak Specific Licensing Basis
  - Industry Guidance
- Supplemental Guidance – Risk Insight
- Summary
- Questions



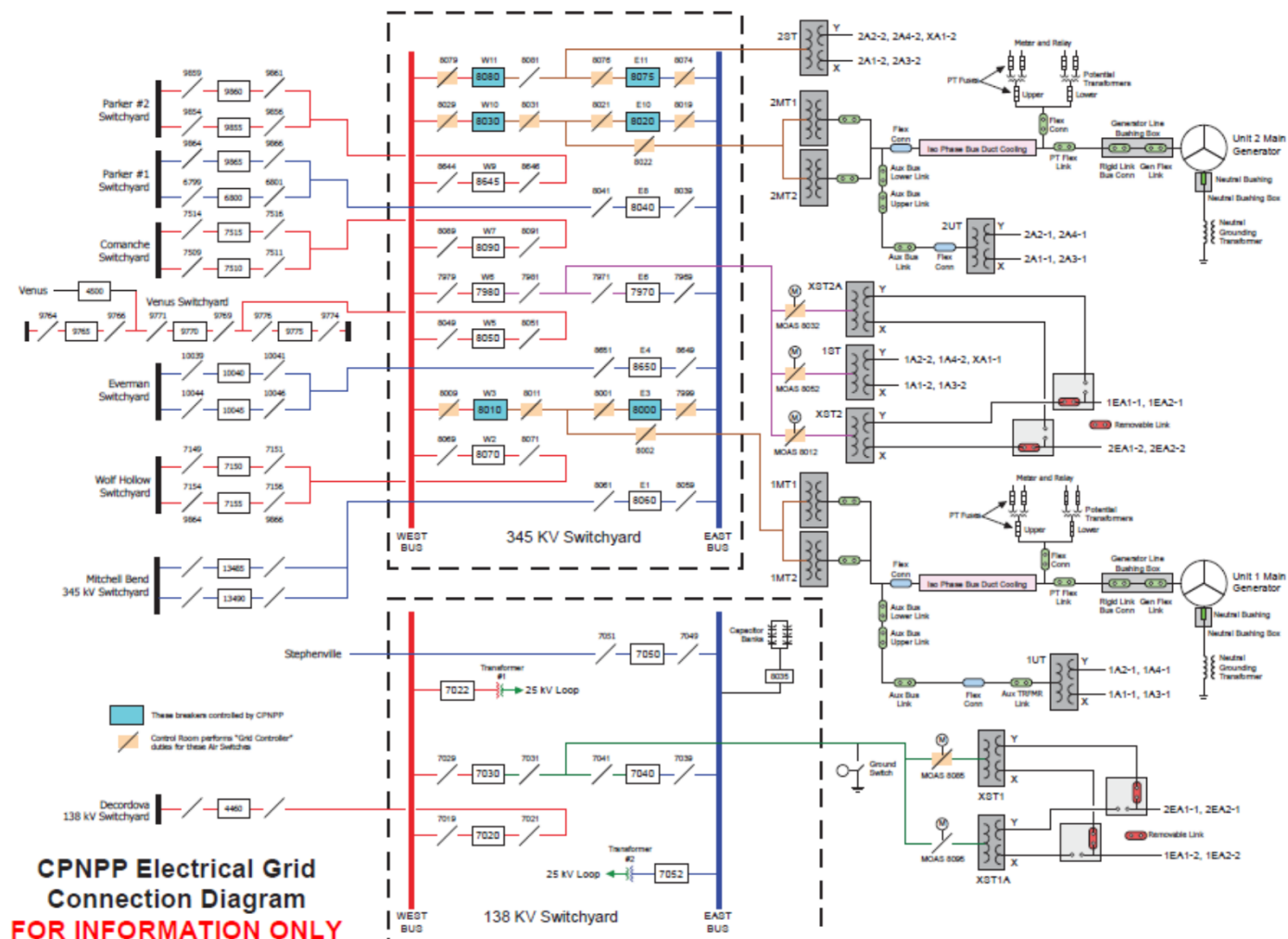
## **Purpose of Meeting**

- Plan to submit LAR 15-001
- Gain understanding of NRC Staff perspectives to be addressed in submittal
  - Level of Detail
  - Technical Content
  - Use of Precedent
  - Regulatory Guidance and Requirements
- Schedule Milestones
  - Pre-submittal Teleconference: **TBD**
  - Submit LAR 15-001: **TBD**
  - Requested Approval Date: **TBD**



## AC Sources System Overview

- At Comanche Peak each unit has two safety-related 6900V buses that are normally power by the “Preferred Offsite Source.”
- If the “preferred offsite source” is not available then there is an “Alternate Offsite Source.”
- If neither the “preferred nor alternate offsite sources” are available, such as during a Loss of All Offsite Power (LOOP), each safety-related 6900V bus may be powered from an Emergency Diesel Generator (EDG) dedicated to each bus.
- The EDGs are designed to supply all necessary loads during a LOOP or a Loss of Coolant Accident (LOCA) concurrent with a LOOP.
- EDG surveillance testing includes a series of sequential and overlapping tests, in which the sum of the tests ensure the entire connection and loading sequence is verified.
- The EDG testing scheme ensures the availability of the standby electrical power supply (EDG) to mitigate Design Basis Accidents (DBA) and transients and to maintain the unit in a safe shutdown condition.





**FOR INFORMATION ONLY**





## Reason for Technical Specification Change

- Long standing issue related to a past Component Design Bases Inspection.
- Apply steady state frequency and voltage criteria only when the preferred and alternate offsite power sources are disconnected and the EDG is carrying the bus.
- Adjust the frequency tolerance to a value that ensures systems and components remain OPERABLE when the EDG is the sole power source ( $\geq 59.9$  Hz &  $\leq 60.1$ Hz).
- EDG steady state frequency of  $\geq 59.9$  Hz and  $\leq 60.1$  Hz ensures adequate frequency at safety related loads for performance of their safety related function.
- The proposed frequency change will be a better indicator of EDG control system OPERABILITY as it is based on engineering evaluation and control system design and not solely on Regulatory Guide 1.9 criteria.





## Description of Proposed Change

- Revise TS 3.8.1, AC Sources – Operating, Surveillance Requirements
  - SR 3.8.1.2 [Ready-to-Load criteria]
  - SR 3.8.1.7 [Ready-to-Load criteria]
  - SR 3.8.11 [Steady State voltage and frequency]
  - SR 3.8.1.12 [Steady State voltage and frequency]
  - SR 3.8.1.13 [Remove NOTE that no longer applies]
  - SR 3.8.1.15 [Steady State voltage and frequency]
  - SR 3.8.1.19 [Steady State voltage and frequency]
  - SR 3.8.1.20 [Ready-to-Load criteria]



## Description of Proposed Change

- SR 3.8.1.2
  - NOTE 3:

A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. ~~When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met.~~
  - **Verify each DG starts from standby conditions and achieves steady state voltage  $\geq 6480$  V and  $\leq 7150$ , and frequency  $\geq 58.8$  Hz and  $\leq 61.2$  Hz in  $\leq 45$  seconds, voltage  $\geq 6480$  V and frequency  $\geq 58.8$  Hz.**
- SR 3.8.1.7
  - **Verify each DG starts from standby conditions and achieves in  $\leq 10$  seconds, voltage  $\geq 6480$  V and frequency  $\geq 58.8$  Hz, and steady state, voltage  $\geq 6480$  V and  $\leq 7150$  V, and frequency  $\geq 58.8$  Hz and  $\leq 61.2$  Hz.**



## Description of Proposed Change

- SR 3.8.1.11
  - Verify on an actual or simulated loss of offsite power signal:
    - c. DG auto-starts from standby condition and:
      - 4. maintains steady state frequency  $\geq 58.8 \text{ Hz}$  ~~59.9 Hz~~ and  $\leq 61.2 \text{ Hz}$  ~~60.1 Hz~~
- SR 3.8.1.12
  - Verify on an actual or simulated Safety Injection (SI) actuation signal each DG auto-starts from standby condition and;
    - b. Achieves steady state voltage  $\geq 6480 \text{ V}$  and  $\leq 7150 \text{ V}$  and frequency  $\geq 58.8 \text{ Hz}$  ~~59.9 Hz~~ and  $\leq 61.2 \text{ Hz}$  ~~60.1 Hz~~;
- SR 3.8.1.13
  - ~~NOTE For Unit 2, testing need only be performed for LOOP concurrent with SI until unit startup following 2RF05.~~



## Description of Proposed Change

- SR 3.8.1.15
  - Verify each DG starts and achieves:
    - b. steady state, voltage  $\geq 6480$  V and  $\leq 7150$  V and frequency  $\geq \cancel{58.8 \text{ Hz}}$  **59.9 Hz** and  $\leq \cancel{61.2 \text{ Hz}}$  **60.1 Hz**
- SR 3.8.1.19
  - Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated SI actuation signal:
    - 4. achieves steady state frequency  $\geq \cancel{58.8 \text{ Hz}}$  **59.9 Hz** and  $\leq \cancel{61.2 \text{ Hz}}$  **60.1 Hz**, and



## Description of Proposed Change

- SR 3.8.1.20
  - Verify when started simultaneously from standby condition each DG achieves in  $\leq 10$  seconds, voltage  $\geq 6480$  V and frequency  $\geq 58.8$  Hz.
  - ~~b. steady state, voltage  $\geq 6480$  V and  $\leq 7150$  V and frequency  $\geq 58.8$  Hz and  $\leq 61.2$  Hz.~~



## Precedent

- Industry Licensing Actions / Amendments were reviewed for applicability to LAR 15-001.
- Arkansas Nuclear One, Units 1 has the following;

SURVEILLANCE REQUIREMENTS	
SURVEILLANCE	FREQUENCY
SR 3.8.1.1      Verify correct breaker alignment and indicated power availability for each required offsite circuit.	7 days
SR 3.8.1.2      -----NOTE----- All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading.  Verify each DG starts from standby conditions and, in ≤ 15 seconds achieves "ready-to-load" conditions.	31 days



## Precedent

- Arkansas Nuclear One, Units 1 has the following (continued);

SURVEILLANCE		FREQUENCY
SR 3.8.1.8	<p>-----NOTE-----</p> <p>All DG starts may be preceded by an engine prelube period.</p> <p>-----</p> <p>Verify on an actual or simulated loss of offsite power signal:</p> <ol style="list-style-type: none"> <li>De-energization of emergency buses;</li> <li>Load shedding from emergency buses; and</li> <li>DG auto-starts from standby condition and:               <ol style="list-style-type: none"> <li>1. achieves "ready-to-load" conditions in <math>\leq 15</math> seconds,</li> <li>2. energizes permanently connected loads,</li> <li>3. energizes auto-connected shutdown load through automatic load sequencing timers, and</li> <li>4. supplies connected loads for <math>\geq 5</math> minutes.</li> </ol> </li> </ol>	18 months



## Precedent

- Arkansas Nuclear One, Units 1 has the following (continued);

SR 3.8.1.9	<p>-----NOTE----- All DG starts may be preceded by an engine prelube period.</p> <p>Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal:</p> <ul style="list-style-type: none"><li>a. De-energization of emergency buses;</li><li>b. Load shedding from emergency buses; and</li><li>c. DG auto-starts from standby condition and:<ul style="list-style-type: none"><li>1. achieves "ready-to-load" conditions in <math>\leq 15</math> seconds,</li><li>2. energizes permanently connected loads,</li><li>3. energizes auto-connected emergency loads through load sequencing timers, and</li><li>4. supplies connected loads for <math>\geq 5</math> minutes.</li></ul></li></ul>	18 months
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## Precedent

- Arkansas Nuclear One, Units 2 has the following (continued);

4.8.1.1.2 Each diesel generator shall be demonstrated OPERABLE: (Note 1)

a. At least once per 31 days on a STAGGERED TEST BASIS by:

1. Verifying the fuel level in the day fuel tank.
2. deleted
3. Verifying the fuel transfer pump can be started and transfers fuel from the storage system to the day tank.
4. Verifying the diesel starts from a standby condition and accelerates to at least 900 rpm in  $\leq 15$  seconds. (Note 2)
5. Verifying the generator is synchronized, loaded to an indicated 2600 to 2850 Kw and operates for  $\geq 60$  minutes. (Notes 3 & 4)
6. Verifying the diesel generator is aligned to provide standby power to the associated emergency busses.



## Precedent

- South Texas Project (STP) had a similar license amendment approved in a letter dated August 20, 2019 under Ascension Number ML19213A147.
  - As STP is not an Improved Technical Specification plant, the correlation is not exact but it is based on the same premise that steady state voltage and frequency should only be part of acceptance criteria when the EDGs are providing power to their related safety bus with no offsite power.



## Technical Evaluation

- Applicable Regulatory Requirements
  - The regulatory basis for Technical Specifications 3.8.1, AC Sources -- Operating is to ensure that a Loss of Offsite Power or a Loss of Coolant Accident with a Loss of Offsite Power are sensed and operation of systems and components important to safety are initiated in order to protect against violating core design limits, challenging the reactor coolant system pressure boundary, and to mitigate the consequences of accidents.
  - 10 CFR 50.36(c), Technical Specifications include the following categories: (1) safety limits, limiting safety systems settings and control settings, (2) limiting conditions for operation, (3) surveillance requirements, (4) design features, and (5) administrative controls.
  - The surveillance requirements for AC Sources -- Operating are included in the technical specifications in accordance with 10 CFR 50.36(c)(3), "Surveillance Requirements."



## Technical Evaluation

- Applicable Regulatory Requirements (continued)
  - General Design Criterion (GDC) 17 "Electric power Systems," of Appendix A "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 requires, among other things, an onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety.
  - The proposed operational change continues to provide onsite electric power supplies, including the batteries, the onsite electric distribution system, and the emergency diesel generators that shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.



## Technical Evaluation

- Applicable Regulatory Requirements (continued)
  - General Design Criterion (GDC) 18 "Inspection and Testing of Electric Power Systems," of Appendix A "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 requires, among other things, Electric power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation, connections, and switchboards, to assess the continuity of the systems and the condition of their components.
  - The proposed operational change continues to periodically test the specific operability and functionality of the Emergency Diesel Generators and loading sequencers.



## Technical Evaluation

- Applicable Regulatory Requirements (continued)
  - Regulatory Guide 1.9 [1971], Selection of Diesel Generator Set Capacity for Standby Power Supplies.
    - The rating of the diesel generators is based on the maximum continuous load demand. This rating exceeds the sum of the conservatively rated loads. Motor loads are based on nameplate rating, pump runout conditions, or flow pressure conditions. 6600 V motor efficiency is based on design data.
    - Each diesel generator set is capable of starting, accelerating to rated speed, and loading all Class 1E loads in the required sequence.
    - Sequencing of large loads at 5 second intervals ensures that large motors have reached rated speed and that voltage and frequency have stabilized before the succeeding loads are applied.



## Technical Evaluation

- Applicable Regulatory Requirements (continued)
  - Regulatory Guide 1.32 [1977], Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants.
    - The offsite power system includes the preferred design stated in NRC Regulatory Guide 1.32: namely, two immediate access circuits from the transmission network are available to the emergency (Class 1E) bus systems.
  - Regulatory Guide 1.93 [1974], Availability of Electric Power Sources.
    - Comanche Peak power operation procedure is in compliance with NRC Regulatory Guide 1.93 as described in technical specifications. The power operation procedure is initiated and continued without restriction only when the limiting conditions for operation (LCO) are met. If the LCOs are not met, the power operation will be restricted in accordance with the technical specification.



## Technical Evaluation

- Applicable Regulatory Requirements (continued)
  - Regulatory Guide 1.108 [1977], Periodic Testing of Diesel Generator Units used as Onsite Electric Power Systems at Nuclear Power Plants.
    - The Comanche Peak design complies with the intent of Regulatory Guide 1.108, Revision 1 (8/77).
  - IEEE 387-1977, Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations.
    - Testability and Maintenance - Circuit design provisions incorporate test capability to periodically monitor the operational capability of the safety-related Class 1E systems during power operation. Initially, all safety-related equipment is tested during the startup testing phase.
    - EDG Periodic Testing - Performed as specified in the Technical Specifications to verify their continued capability and availability to perform their design function after commercial operation of the plant.





## Technical Evaluation

- Applicable Regulatory Requirements (continued)
  - The Comanche Peak preventative maintenance program is established to prevent failures.
    - Should failures occur, the program functions to identify root cause of any malfunction and perform required repairs or component replacement.
    - Following repairs or maintenance, a final equipment check is performed prior to starting of any tests.
    - Upon satisfactory completion of post-maintenance testing, control of equipment is transferred to the control room operator.



## Technical Evaluation

- Applicable Regulatory Requirements (continued)
  - There are no regulatory commitments outside of the Technical Specification Surveillance Requirements in Limiting Condition for Operation 3.8.1, AC Sources – Operating.
  - The proposed changes to the surveillance requirements are being submitted as stated in 10 CFR 50.59(c)(1)(i), pursuant to 10 CFR 50.90.



## Supplemental Information

- Risk Impacts
  - No additional risk is identified due to the proposed change in surveillance requirement acceptance criteria.
  - The proposed change will avoid connecting high accuracy, test equipment for EDG frequency while in MODES 1, 2, 3, and 4 when both EDGs are required to be OPERABLE. This eliminates the intrinsic risk when connecting test equipment to OPERABLE components.
  - The proposed change also continues to limit the time the EDGs are run unloaded. Running an EDG unloaded leads to turbocharger carbon buildup.
  - The proposed change limits installation of test equipment for high accuracy frequency measurement to MODES when only one EDG is required to be OPERABLE. The testing is performed on the train that is not operable, so there is no impact on Technical Specification operability. TS 3.8.1, AC Sources – Operating is replaced by TS 3.8.2, AC Sources – Shutdown in MODES 5 and 6.



## Summary

- Results of this deterministic evaluation / analysis provides assurance that the systems and equipment required to safely shutdown the plant and mitigate the effects of a design basis accident will remain capable of performing their safety functions.
- No additional risk is identified due to the proposed surveillance requirement acceptance criteria changes.
- The proposed changes to TS 3.8.1, surveillance requirements are consistent with NRC guidance and meet the following principles:
  - Meets the current regulations
  - Consistent with defense-in-depth philosophy
  - Maintains sufficient safety margins
- Questions