Comanche Peak Nuclear Power Plant (CPNPP) Pre-Submittal Meeting with the NRC for Proposed License Amendment Request (LAR) 23-002, Application Regarding General Design Criteria 5 (GDC-5) Shared System Requirements

Licensee Amendment to Receive NRC Approval for an Exception to Regulatory Guide (RG) 1.81, Revision 1, Regulatory Positions C.1 and C.3

Agenda

- Reason the LAR is Necessary
- Applicable Regulatory Requirements
- CPNPP Current Position Towards RG 1.81, Revision 1
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Reason the LAR is Necessary

CPNPP has received a Notice of Violation (NOV) based on not resolving a previous Non-Cited Violation (NCV) in a timely manner. The NOV reads in-part:

"The previous violation identified the licensee's failure to obtain a license amendment or perform a written evaluation demonstrating the basis for not obtaining a license amendment prior to making a change to the facility as described in the Final Safety Analysis Report. Specifically, the licensee revised the Final Safety Analysis Report to change the facility's commitments to NRC Regulatory Guide 1.81, which demonstrated compliance with General Design Criterion 5, ***without obtaining a license amendment****."*

In the required NOV response to the NRC, CPNPP made a commitment to the NRC that reads:

"A 10CFR50.59 evaluation will be performed, and ***a license amendment will be submitted to address CPNPP' s commitments to NRC Regulatory Guide (RG) 1.81.****"*

Based on this, the upcoming LAR is necessary to resolve the NRC concern with CPNPP's commitment to RG 1.81

Applicable Regulatory Requirements – GDC 5 and GDC 17

General Design Criteria 5 – Sharing of Structures, Systems, and Components

"Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units."

General Design Criteria 17 – Electric Power Systems

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

Applicable Regulatory Requirements – RG 1.81, Regulatory Positions C.1 & C.3

Regulatory Guide 1.81, Revision 1, Regulatory Position C.1

"D.C. systems in multi-unit nuclear power plants should not be shared."

Regulatory Guide 1.81, Revision 1, Regulatory Position C.3

"In the case of multi-unit nuclear power plants for which the construction permit application was made on or after June 1, 1973, each unit should have separate and independent onsite emergency and shutdown electric systems, both a.c. and d.c., capable of supplying minimum ESF loads and the loads required for attaining a safe and orderly cold shutdown of the unit, assuming a single failure and loss of offsite power."

Applicable Regulatory Requirements – RG 1.6, RG 1.9, and RG 1.47 Summaries

Regulatory Guide 1.6, Revision 0, describes an acceptable degree of independence between redundant standby (onsite) power sources and between their distribution systems.

Regulatory Guide 1.9, Revision 0, describes an acceptable basis for the selection of diesel generator sets of sufficient capacity and margin to implement GDC 17.

Regulatory Guide 1.47, Revision 0, describes an acceptable method of complying with the requirements of IEEE Standard 279-1971 and Appendix B to 10 CFR Part 50 with regard to indicating the inoperable status of a portion of the protection system (as defined in IEEE Standard 279-1971), systems actuated or controlled by the protection system, and auxiliary or supporting systems that must be operable for the protection system and the systems it actuates to perform their safety-related functions.

CPNPP Current Position Towards RG 1.81, Revision 1

"The CPNPP design is in compliance with the provisions of Regulatory Guide 1.81 with an exception to Regulatory Position C1 as described below.

Safety-related loads shared between both units are powered from common MCCs, 120-VAC panels, 118-VAC panels, and 125-VDC panels as described in Subsections 8.3.1.1.9, 8.3.1.1.13 and 8.3.2.1. Indication of source of power associated with the common electrical equipment mentioned above is provided on a common panel located in the Control Room and accessible to both unit operators.

A single failure at the system level will not affect the capability to automatically supply minimum ESF loads in any one unit and safely shutdown the other unit assuming a loss of off-site power because the redundancy of common buses is maintained the same as redundancy for Unit 1 and Unit 2 buses.

On-site power capacity to energize sufficient seismic Category I equipment to attain a safe and orderly cold shutdown of both the units, assuming the loss of off-site power and most severe design basis event and a single failure in the on-site electrical system, is not compromised as a result of common buses because each unit system is designed to have sufficient capacity to feed common bus loads in addition to the unit specific loads.

The CPNPP design is controlled such that only common loads are fed from common buses except for some DC / 118-VAC common panels which feed Unit 1 loads also and the normal source of power for the panels is Unit 1. This does not affect the capability of any unit to feed these loads adequately. Because the unit specific loads of only one unit are fed from a common panel and the common panel normal power source is the same unit, therefore, under normal operation, the interaction between the units for maintenance and test operation will be no different than what is required for a common panel. The time when such common panel is aligned to the unit other than the one whose specific loads it feeds will be limited, therefore, any additional interaction needed for maintenance and test activities will be limited also."

Proposed Change to the CPNPP Position Towards RG 1.81, Revision 1

"The CPNPP design represents a deviation of Regulatory Guide 1.81, Regulatory Positions C.1 and C.3, as approved in Amendments [xxx] and [xxx] to the Unit 1 and Unit 2 facility licenses, respectively (Reference 49). Regulatory Position C.1 states that D.C. systems in multi-unit nuclear power plants should not be shared. Regulatory Position C.3 states that each unit should have separate and independent onsite emergency and shutdown electric systems (i.e., vital power should not be shared between units). The CPNPP design includes some safety related common loads, which is a deviation from Regulatory Guide 1.81, Regulatory Positions C.1 and C.3. The acceptability of this design is described below and is in compliance with GDC 5 in that the sharing of these loads does not significantly impair the ability to perform the necessary safety functions, assuming an accident in one unit and an orderly shutdown and cooldown of the remaining unit.

Safety-related loads shared between both units are powered from common MCCs, 120-VAC panels, 118-VAC panels, and 125-VDC panels as described in Subsections 8.3.1.1.9, 8.3.1.1.13 and 8.3.2.1. Indication of source of power associated with the common electrical equipment mentioned above is provided on a common panel located in the Control Room and accessible to both unit operators.

A single failure at the system level will not affect the capability to automatically supply minimum ESF loads in any one unit and safely shutdown the other unit assuming a loss of off-site power because the redundancy of common buses is maintained the same as redundancy for Unit 1 and Unit 2 buses.

On-site power capacity to energize sufficient seismic Category I equipment to attain a safe and orderly cold shutdown of both the units, assuming the loss of off-site power and most severe design basis event and a single failure in the on-site electrical system, is not compromised as a result of common buses because each unit system is designed to have sufficient capacity to feed common bus loads in addition to the unit specific loads.

The CPNPP design is controlled such that only common loads are fed from common buses except for some DC / 118-VAC common panels which feed Unit 1 loads also and the normal source of power for the panels is Unit 1. This does not affect the capability of any unit to feed these loads adequately. Because the unit specific loads of only one unit are fed from a common panel and the common panel normal power source is the same unit, therefore, under normal operation, the interaction between the units for maintenance and test operation will be no different than what is required for a common panel. The time when such common panel is aligned to the unit other than the one whose specific loads it feeds will be limited, therefore, any additional interaction needed for maintenance and test activities will be limited also."

Background

The CPNPP Unit 1 and Unit 2 design includes some common loads which can be powered from either unit, including receiving power from Class 1E vital AC and DC sources.

The DC Power System sharing of common loads was noted in CPNPP SER, NUREG-0797 Supplement 22:

"There are no bus ties or sharing of power supplies between redundant trains. Class 1E equipment associated with systems shared by both units receives power from panel boards having an incoming automatic transfer switch which can select power from either unit. Transfer switch design is such that power cannot be supplied from both units simultaneously. Train separation is maintained by supplying these shared panel boards from the same train of both units. Sharing of these power sources in this manner does not significantly impair the ability of these sources to perform their safety function and, as such, this arrangement is in accordance with GDC 5."

"On the basis of its review of the dc power system as described in the FSAR, the staff concludes that two fully redundant Class 1E dc systems are provided. The systems are testable, independent, and conform to the requirements of Regulatory Guides 1.6 and 1.32. These systems meet the requirements of GDC 5, 17, and 13 and are, therefore, acceptable."

Background (cont.)

The AC Power Systems ability to share common loads was noted in NUREG-0797, Supplement 22:

"Nuclear-safety-related loads common to both units are powered from Class 1E MCCs [motor control centers] and distribution panels which have supplies from each unit. Class 1E MCCs and distribution panels common to both units shall be aligned to be powered from Unit 1 only until Unit 2 design, installation, and testing are complete. These dual-unit supplies are interlocked to preclude supplying power to one MCC or distribution panel from both units simultaneously. Incoming feeders to train A MCCs or distribution panels common to both units are supplied only from train A power systems of both units (a similar arrangement exists for train B equipment and incoming feeders). This ensures the proper train separation between equipment common to both units."

However, NUREG-0797, Supplement 22 later notes that:

"There is no sharing of emergency power sources between units, which is in accordance with RG 1.81."

Technical Evaluation – 118 VAC

118 VAC instrument distribution panels XEC1-1 and XEC2-1 provide power to common and Unit 1 specific safety-related loads. Associated inverters feed supply power to these panels and are normally powered from vital 480 VAC sources but will automatically transfer to the associated 125 VDC battery if AC power is lost. CPNPP has administratively disallowed powering XEC1-1 and XEC1-2 from Unit 2 unless Unit 1 is defueled, due to the potential for some relays to not function properly when these panels were powered from the Unit 2 source, following a loss of the Unit 2 power source with coincident Unit 1 safety injection (SI) signal. The failure of these relays to actuate would prevent some automatic SI functions from occurring (such as some required load shedding, fan starts, valve re-positionings, etc.) following a Unit 1 SI signal.

Technical Evaluation – 125 VDC

125 VDC distribution panels XED1 and XED2 are normally aligned to Unit 1 through automatic transfer switches, and supply power to common and Unit 1 specific safety-related loads. Evaluations confirmed that the power sources, from both units, feeding the common buses have sufficient capacity and capability to adequately feed all the common bus loads, as stated in the FSAR. Nevertheless, procedures maintain the panels normally powered from Unit 1 and limit the time power is supplied from Unit 2 by limiting the time of maintenance and testing activities.

Technical Evaluation – Unit 2 Specific Loads

With respect to Unit 2, no Unit 2 specific loads are powered from the subject common panels (XEC1-1/XEC1-2/XED1/XED2). With no Unit 2 specific loads powered from a Unit 1 source, no further adverse impacts on safety function performance were identified.

Technical Evaluation – Single Failure Considerations

Due to the sharing of systems being train-separated (Train A common system loads are fed **ONLY** from Unit 1 and Unit 2 Train A sources, and Train B common system loads are fed **ONLY** from Unit 1 and Unit 2 Train B sources), and being limited to only two units, a single failure at the system level would not preclude the capability to automatically supply minimum ESF loads in any one unit and safely shutdown the other unit, assuming a loss of off-site power (LOOP).

Technical Evaluation – Summary

1. The design does not significantly impair the ability to perform the specified safety functions, including an assumption of an accident in one unit and coincident orderly shutdown and cooldown of the remaining unit, and, therefore, meets the requirements of 10 CFR 50, Appendix A, GDC 5, "Sharing of structures, systems, and components."

2. For common vital 118 VAC buses/panels supplying Unit 1 specific loads, administrative controls require these buses/panels to be aligned from Unit 1 power sources, except when Unit 1 is defueled.

3. The shared power sources from both units (DC and AC) feeding the common buses have sufficient capacity and capability to adequately feed all the common bus loads, as stated in the FSAR.

4. The sharing of the electrical power supplies is limited between two units only.

5. Because redundancy for common systems is maintained consistent with that of unit-specific safety related trains, a single failure at the system level will not preclude the capability to automatically supply minimum safety-related loads in any one unit and safely shutdown the other unit assuming a loss of offsite power.

6. The design of the common 125 VDC and 118 VAC system panels conforms to the requirements of GDC 17, "Electrical Power Systems" (Reference 9), RG 1.6 (Reference 6), RG 1.9 (Reference 7), and RG 1.47 (Reference 8).

LAR Schedule

Pre-Submittal Meeting on 03/28/23

Submittal of LAR by 04/22/23

Request Approval of LAR by 05/29/24

Implementation of LAR by **06/28/24 – Committed to in NOV response**

Questions?