Draft

Request for Additional Information No. 87 (1149,1124,1238,992), Revision 0

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U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.01.03 - Spent Fuel Pool Cooling and Cleanup System
Application Section: FSAR 9.1.3
SRP Section: 09.02.04 - Potable and Sanitary Water Systems
SRP Section: 09.03.02 - Process and Post-Accident Sampling Systems
SRP Section: 09.05.07 - Emergency Diesel Engine Lubrication System
SBPA and SPCV Branches

QUESTIONS

09.01.03-4

Regulatory Guide 1.29, Positions C.1 and C.2 provide guidance for meeting the seismic design requirements of GDC 2. The applicant states that the fuel pool cooling and purification (FPCPS) design meets the requirements of Regulatory Guide 1.29, Positions C.1 (for the safety portion) and C.2 (for the non-safety portion). The applicant also states that the system is designed to meet the requirements of Regulatory Guide 1.13, Positions C.1, C.2, and C.3.

However, FSAR Tier 2 Figure 9.1.3-2 shows the seismic qualification of non-safety portions of the purification system within the fuel building to be non-seismic category (NSC) rather than Seismic Category II. In this case, it is not clear how the design meets Position C.2 of Regulatory Guide 1.29 since the NSC design provides no assurance of piping integrity in a seismic event.

The staff requests the applicant to include in the FSAR the justification for the protection of the safety related SSCs from the failure of the NSC components.

09.01.03-5

In FSAR Section 9.1.3.4, the applicant states that with pool temperature at the structural design limit of 82.2°C (180°F) and considering a single failure in the FPCS, the system can remove a heat load of 0.3% reactor rated thermal power (6.9 Mw) with component cooling water (CCW) inlet temperature at the maximum value of 45°C (113°F). However, 6.9 MWt is not 0.3% of the reactor rated thermal power of 4590 MWt.

The staff requests the applicant to update the FSER in order to clarify the design basis of the FPCS.

09.01.03-6

GDC 61 requires fuel handling and storage facilities to provide for decay heat removal that reflects its importance to safety. To achieve this objective, forced circulation cooling that maintains pool temperatures suitable for fuel handling during routine operations is

required. FSAR Tier 2 Section 9.1.3.4.5 makes several statements relative to heat removal capabilities of the SFP cooling system but does not provide sufficient detail for independent confirmation of these statements.

The staff requests the applicant to update the FSER and include a more detailed description of the FPCS heat removal capabilities. The additional information should include:

1. a discussion of the FPCS thermal analysis assumptions;
2. the number of fuel assemblies that are assumed to be present in the SFP for all the different scenarios evaluated;
3. provide the minimum required in-vessel decay time before fuel can begin to be off-loaded to the SFP;
4. provide the "time to boil" and boil off rates if both FPCS are unavailable;
5. compare the boil-off rates to the available make up capability.

09.01.03-7

GDC 61, as related to the system design for fuel storage and handling of radioactive materials, requires that the design includes the capability and capacity to remove corrosion products, radioactive materials and impurities from the pool water and reduce occupational exposures to radiation. Typical purification system design includes filtering in stages to prevent overloading the filters that remove the smallest particulate. However, design data presented for cartridge filters in Table 9.1.3-1 indicates that the cartridge pre-filter retention rating is 1 micron while the cartridge post-filter rating is 10 micron; this is not a typical configuration. Include in the FSAR a more detail description of the design of the purification system.

09.01.03-8

GDC 61 as related to the system design for fuel storage and handling of radioactive materials requires maintenance of coolant volume of the pool by preventing inadvertent draining or siphoning of pool water. FSAR Section 9.1.3 states that SFP piping penetrations are located to be a minimum of 20 feet above the top of the active fuel and that the piping is designed to preclude possible siphoning of coolant from the pool. The FSAR states that these features were implemented to prevent inadvertent draining of the pool to assure more than 10 feet of water remains above the active fuel, with the consequent loss of both cooling and shielding and that the minimum water levels are intended to prevent loss of suction to the fuel pool cooling pumps. However, FSAR Section 9.1.3 and Figures (Tier 1 2.2.5-1 and Tier 2 9.1.3-2) do not clearly indicate how the anti-siphon features are implemented. Update the FSAR in order to provide additional pipe routing details to demonstrate the anti-siphon features, including the minimum suction requirements for the cooling pumps.

09.01.03-9

The FPCS is required to be operational while there is fuel stored in the SFP. The staff did not find TS requirements to address the failure of these systems under normal operations or before, during, and after a refueling outage. Justify the exclusion of TSs that address functionality of the FPCS during normal conditions or (before, during and after a refueling) outages.

09.01.03-10

In FSAR Tier 2 Chapter 14.2 (Initial Startup Test Program), Test #001 addresses the FPCPS. The system will be tested for various leakage paths, make-up capacity, system flow rates, pump-head, and related critical parameters. The applicant stated that the acceptance criteria for this testing will be in FSAR Tier 2 Section 9.1.3. The staff could not identify the applicable acceptance criteria for Test # 001. Provide in the FSAR a list of the initial conditions and the specific acceptance criteria for Test # 001.

09.02.04-1

General Design Criteria (GDC) 60 requires nuclear power unit designs to include means to control the release of radioactive materials in gaseous and liquid effluents produced during normal reactor operation, including anticipated operational occurrences. SRP Section 9.2.4, "Potable and Sanitary Water Systems," provides guidance on means acceptable to the NRC for potable and sanitary water system compliance with GDC 60. SRP 9.2.4 Section II "Acceptance Criteria" includes Item 1.B, which states "The potable water system is protected by an air gap, where necessary." Also included in Section II of SRP 9.2.4 is Item # 1.C, which states "An evaluation of potential radiological contamination, including accidental... indicates that the system will not result in contamination beyond acceptable limits."

The EPR application states "All of the PSWS piping, venting, and valving arrangements are separated from all other plant chemical or radiological processes, treatments and drainage systems. This prevents the PSWS from potentially being contaminated with radioactive material and complies with the acceptance criteria relating to 10 CFR Part 50, Appendix A, GDC 60." Additional information is needed to determine conformance with the SRP 9.2.4 acceptance criteria above, specifically:

A) Provide specific details in the FSAR on the "separation" of the PSWS from all other plant chemical or radiological processes. Provide the separation methodology employed to prevent the PSWS from becoming contaminated.

B) Confirm in the FSAR that potential radiologically contaminated backflow into the PSWS has been addressed and no air gaps are required.

09.03.02-1

GDC 60 requires the control of releases of radioactive materials to the environment , during normal reactor operations and including anticipated operational occurrences. This requirement applies to the process sampling system (PSS) described in FSAR Tier 2 Section 9.3.2. This includes minimizing the leakage from those portions of the process sampling systems outside the containment that may contain radioactive material. An acceptable means to prevent release of radioactive materials to the environment is with the use of passive flow restrictions to limit radioactive fluid loss from a rupture of a sample line outside containment.

The flow restrictions should be sized to reduce this rate of fluid loss to the extent practical without adversely affecting the capability of the sample instruments to function. In particular, the response time of the instruments should not be unacceptably long because of the flow restrictions. Nor should they be sized so small that they are susceptible to plugging. They

should also be located as close as practical to the sample line connection to the radioactive system being sampled.

For the nuclear sampling system (NSS) lines which sample the reactor coolant system, the secondary sampling system (SECSS) lines which sample steam generator blowdown, and the severe accident sampling system (SASS) lines, provide: the sampling line sizes; the flow restriction sizes; and, the FSAR figures where these sizes are shown. If the line sizes themselves are proposed to satisfy the flow restriction requirement, provide the rationale for their acceptance.

09.05.07-1

NUREG/CR-0660, “Enhancement of Onsite Emergency Diesel Generator Reliability” cautions against pre-lube periods exceeding 5 minutes unless approved by the diesel manufacturer. SRP 9.5.7, Section III.3.F and G, which is based on NUREG/CR-0660, state the same caution.

FSAR Tier 2 Section 9.5.7.2.1 states that while in standby the pre-lube system supplies oil to the main engine lubricating oil header. Section 9.5.7.3.1 states that during standby, this system provides continuous pre-lubrication.

Justify the diesel generator lubricating system (DGLS) compliance with the guidelines presented in SRP 9.5.7 Section III.F and G or
revise the FSAR accordingly to clarify compliance with the above stated guidelines.

09.05.07-2

General Design Criteria (GDC) 2 and GDC 4 require that safety-related portions of the diesel generator lubricating system (DGLS) be protected from natural phenomena and the effects of events such as internal missiles and pipe break. FSAR Tier 2, Section 9.5.7.2.4 states that the DGLS remains functional after a safe shutdown earthquake (SSE). FSAR Tier 2, Figure 9.5.7-1 shows the pre-lube and keep warm system as Seismic Classification non-seismic (NSC). FSAR Tier 2, Section 3.2.1.5 defines non-seismic components as not subject to any seismic design criteria invoked by the applicable commercial or industrial codes and standards, and not falling within the RG 1.29, “Seismic Design Classification,” criteria for classification as Seismic Category I or II. The pre-lube and keep warm systems are directly connected to the seismic Category I section of the DGLS. In view of the foregoing:

a) Provide the methodology for the possible failure of the pre-lube and keep warm portion of the system during a seismic event not adversely affecting the seismic Category I and safety-related portions of the DGLS and causing the DGLS to lose fluid and system pressure.
b) Justify the pre-lube and keep warm portion of the system not being classified as Seismic Class II rather than NSC.

Revise the FSAR accordingly to clarify compliance with the above stated requirements and guidelines.

09.05.07-3

FSAR Tier 2, Section 9.5.7.2.2 states that the auxiliary lube oil tank is located in the diesel room. FSAR Tier 2 Figure 9.5.7-1 shows fill line with an oil filter and a vent line. Confirm that the fill and vent lines are also in the emergency power generation building (EPGB). If

not, provide their protection in accordance with General Design Criteria (GDC) 2 from natural phenomena like earthquakes, tornadoes, hurricanes, floods and tornado missiles; and in accordance with GDC 4 from other missiles.

Revise the FSAR accordingly to clarify compliance with the above stated requirements and guidelines.

09.05.07-4

General Design Criteria (GDC) 4 requires structures, systems and components (SSC) important to safety to be protected from pipe failures. The applicant stated that there are no high energy lines in the emergency power generation building (EPGB). The applicant did not address the effects of pipe breaks in moderate energy lines upon the diesel generator lubricating system (DGLS). Moderate energy lines include any pipe with pressure less than 275 psig and temperature less than 200 degrees F. Explain the effects of possible moderate energy line failures in the EBGB on the DGLS system that are important to safety.

Revise the FSAR accordingly to clarify compliance with the above stated requirements and guidelines.

09.05.07-5

10 CFR 52.47(b) (1) requires that a DC application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the ITAAC are performed and the acceptance criteria met, a plant that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations

The emergency diesel generators (EDG) provide emergency power that is required by NRC regulations (GDC-17 of Appendix A to 10 CFR 50). Satisfactory installation and testing of the diesel generator lubricating system (DGLS) is necessary for EDG operation to full design requirements. Yet, the FSAR Tier 1 excludes an ITAAC that meets the above requirements. The existing ITAAC does not verify that a) the DGLS is installed in accordance with design, and b) the DGLS will operate in accordance with design, i.e. DGLS operating pressure, temperature differentials, flow rate and heat removal rate are in accordance with the engine manufacturer's recommendations and thus ensure reliable DGLS operation.

Provide an ITAAC in FSAR Tier 1 for the DGLS that meets the above requirements.

09.05.07-6

The auxiliary lube oil storage tank is needed for a 7-day supply of lube oil to support continuous engine operation and its contents is associated with Technical Specification Limited Condition of Operability (LCO) 3.8.3, yet FSAR Tier 2, Section 9.5.7.2.2 designates this tank as non-safety related. Note that FSAR Tier 2 Figure 9.5.7-1 does not show the C-to-E class-break between the lube oil storage tank and its connected piping and valves, which would indicate that the tank is safety-related.

a) Explain the apparent inconsistency

b) Justify excluding the auxiliary lube oil storage tank from the emergency diesel generator (EDG) mechanical equipment in FSAR Tier 1, Table 2.5.4-1.
c) Finally, justify excluding other safety related diesel generator lubricating system (DGLS) components from FSAR Tier 1 Table 2.5.4-1?

Revise the FSAR accordingly to clarify compliance with the above stated requirements and guidelines.

09.05.07-7

Standard Review Plan (SRP) Section 9.5.7 states that one of the guidelines for meeting the requirements of General Design Criteria (GDC) 17 is that each emergency diesel generator (EDG) have seven days of onsite storage capacity as specified in ANSI/ANS-59.52-1998,"American National Standard Lubricating Oil Systems for Safety-Related Emergency Diesel Generators." ANSI/ANS 59.52-1998 states that "each EDG shall have a storage capacity to maintain at least seven days of operation without dropping below the manufacturer's recommended minimum lubricating oil inventory." [Section 5.3 of ANSI/ANS 59.52-1998]

However, TS "B 3.8.3 Diesel Fuel Oil, Lube Oil, and Starting Air" Bases LCO on page B 3.8.3-2 of the FSAR states "…sufficient lubricating oil supply must be available to ensure the capability to operate at full load for 3 ½ days. This requirement, in conjunction with the ability to obtain replacement supplies within 3 ½ days, supports the availability of EDGs required to shutdown the reactor and to maintain it in a safe condition for an AOO or a postulated accident with loss of offsite power." This statement is not in compliance with the guidelines of SRP Section 9.5.7 and ANSI/ANS -59.52-1998.

The staff does not consider "the ability to obtain replacement supplies within 3 ½ days" as helping to satisfy the criteria of having seven days of onsite storage. Justify the FSAR not meeting the guidelines of SRP Section 9.5.7 and ANSI/ANS-59.52-1998 and provide the methodology for meeting the regulatory guidelines as stated above.

09.05.07-8

FSAR Tier 2 Chapter 16, "Technical Specifications," (TS), includes a limiting condition of operation (LCO), 3.8.3.B, conditioned on one or more EDGs with a lube oil inventory less than 750 gal and greater than 635 gal. The basis for this LCO is provided in B 3.8.3 LCO as follows:

> "……. Each engine oil sump contains an inventory capable of supporting a minimum of 3 1/2 days of operation. The onsite storage in addition to the engine oil sump is sufficient to ensure 7 days of continuous operation. This supply is sufficient to allow the operator to replenish lube oil from outside sources."

Technical Specifications TS LCO 3.8.3.B requires a minimum of 750 gallons of lubricating oil inventory, but the application is not clear whether this volume includes the sump, and if so, whether the sump level is measured during Surveillance Requirement (SR) 3.8.3.2. The application is not clear if 750 gallons is in addition to the manufacturer's recommended minimum lubricating oil inventory. Provide the following information:

1. The values of "C", EDG lube oil storage capacity; "L", required capacity of lubricating oil to fill completely the EDG lubricating oil system to the manufacturer's recommended min

level; and “Lr”, consumption rate at licensed engine rating, as defined in Section 5.2 of ANSI/ANS 59.52-1998.

2. The methodology for factoring the manufacturer’s recommended minimum lubricating oil inventory, which must be at least 7 days of oil inventory, into the specified minimum inventory value expressed in TS LCO 3.8.3B and Surveillance Requirement (SR) 3.8.3.2.

3. TS LCO 3.8.3B and Surveillance Requirement (SR) 3.8.3.2 state the minimum oil inventory is 750 gallons.
   a. Confirm that this inventory includes the volume in the EDG sump. If so, provide the means to verify sump level. The LCO and SR 3.8.3.2 are not clear; the applicant needs to clarify the LCO and SR.
   b. Verify that the quantity of stored lube oil accounts for a 10% margin above the 7-day guideline as stated in ANSI/ANS 59.52-1998.
   c. The application in Figure 9.5.7-1 shows the capacity of each EDG’s lube oil storage tank to be 4542 liter (1200 gallon). Provide the basis for the 4542 liter (1200 gallon) tank capacity.
   d. Provide the significance of the 750 gallon and 635 gallon levels stated in TS Bases B3.8.3.

Chapter 9 of the FSAR needs to be revised to clearly address these concerns. TS LCO 3.8.3B and Surveillance Requirement (SR) 3.8.3.2 of Chapter 16 (TS) need to be revised to clearly identify the tanks and/or sumps that are measured to verify minimum oil inventory. TS Bases B3.8.3 needs to be revised to clarify the significance of the 750 gallon and 635 gallon levels.

09.05.07-9

Emergency Diesel Generator Auxiliaries Test #106 of FSAR Tier 2 Section 14.2 confirms the 7-day requirement for fuel oil storage but does not confirm the 7-day requirement for lubricating oil storage. Provide assurance that the lubicating oil storage design will confirm to the 7-day storage requirement.

Revise the FSAR accordingly.

09.05.07-10

FSAR Tier 2 Section 9.5.7.4,”Safety Evaluation,” states that the diesel generator lubricating system (DGLS) for each diesel engine is independent of any other diesel engine system and that with a four-division design of the emergency diesel generator (EDGs), a single failure of the DGLS portion will not compromise the EDG safety function. In addition to the above design criteria, the guidelines of SRP Section 9.5.7 also state that a loss of a cooling source will not lead to a loss to more than one EDG. Confirm that the loss of a cooling source in the US EPR Standard Design Certification could not lead to loss of more than one EDG. Revise the FSAR accordingly to clarify compliance with the SRP Section 9.5.7 guideline.