ArevaEPRDCPEm Resource

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Sent: Tuesday, August 25, 2009 2:40 PM
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Subject: Draft - U.S. EPR Design Certification Application RAI No. 280 (3307, 3554), FSAR Ch. 12
Attachments: Draft RAI_280_CHPB_3307_3554.doc

Attached please find draft RAI No. 280 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
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Request for Additional Information No. 280 (3307, 3554), Revision 1

8/25/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 12.02 - Radiation Sources
SRP Section: 12.03-12.04 - Radiation Protection Design Features

Application Section: FSAR Ch. 12

QUESTIONS for Health Physics Branch (CHPB)

12.02-5

POTENTIAL OPEN ITEM

RG 1.206, Section C.I.12.2.1, "Contained Sources," states that the applicant should describe the sources of radiation during normal and accident conditions, that are the basis for the radiation protection design. Sources should be tabulated by isotopic composition or gamma ray energy groups, strength (becquerel or curie content), and geometry. The basis for these values should also be provided.

In response to RAI 150 (1656) Question 12.02-3 and RAI 150 (1606) Question 12.03-12.04-4, the applicant provided information on radiation sources which constitute a radiation protection and shielding concern, including spent fuel, the safety injection system (post-LOCA), the residual heat removal system (after shutdown) and the movable in-core flux mapping system (or aeroball system). The response provided was acceptable, however the applicant did not incorporate any changes into the EPR FSAR. Please update Section 12.2 of the EPR FSAR to include, for each of the above systems, the source term information (i.e., photon spectra) and basis for those values provided in the applicant's response to RAI 150 (1656) Question 12.02-3 and Question 12.03-12.04-3, in accordance with the guidance provided in RG 1.206.

12.02-6

POTENTIAL OPEN ITEM

In order to demonstrate the EPR design's compliance with the occupational dose limits of 10 CFR 20.1201 the applicant provided airborne concentrations for the reactor building and the fuel building in Section 12.2 of the EPR FSAR. An overview of the methodology used to calculate these airborne concentrations was provided in response to RAI 150 (1656) Question 12.02-2. However, the staff has some additional questions regarding the following points:

1. The EPR FSAR Table 12.2-19, "Parameters and Assumptions for Calculating Airborne Radioactive Concentrations," states that the containment building equipment area filtered recirculation filtration efficiencies is 90% for all nuclides

except for noble gases and N-16." Please also provide information on the filtration efficiency (or lack thereof) for tritium.

2. The applicant's response to RAI 150 (1656) Question 12.02-2 includes the equation used to calculate the evaporation rate from the spent fuel pool. Please provide the source and basis for this equation.
3. The response to RAI 150 (1656) Question 12.02-2 states that "the multiplier used for tritium was based on a 1 percent diffusion rate from the design basis activity calculation." Please provide the basis for selecting the 1 percent diffusion rate.
4. In order to calculate the airborne calculations for the service compartments a 1% per day leakage rate from the equipment area to the service area was assumed. Provide the basis for this assumption.

12.03-12.04-17

POTENTIAL OPEN ITEM

Background

GDC 61 requires that the fuel storage and transfer system, in addition to any other system which may contain radioactivity, be designed to ensure adequate safety and shielding, as well as designed to prevent the release of radioactive material during normal and accident conditions.

Generic Safety Issue 137 (GSI-137) "Refueling Cavity Seal Failure" was initiated to consider a Reactor Cavity Seal Ring failure as an initiating event for a Spent Fuel Pool accident sequence (see NRC Bulletin 84-03). GSI-137 noted the following possible consequences to a reactor cavity seal ring failure; (1) high radiation levels in the containment due to uncovering of spent fuel during transfer, (2) radioactive material release in the containment building due to rupture of fuel pins (by self-heating after uncovering), (3) high radiation levels in the spent fuel building due to uncovering of stored spent fuel, and (4) radioactive material release outside the containment building due to rupture of fuel pins in the storage pool. The mitigation actions for evaluation of this event was the installation of permanent reactor cavity seal rings, and the installation of cover dams between the refueling cavity and the spent fuel pool to prevent draining the SFP.

In their response to NRC Bulletin 84-03, "Refueling Cavity Water Seal," a number of licensees indicated that if a large seal leak occurred, the refueling cavity could drain rapidly and the procedures and makeup capability for refilling the refueling cavity would be insufficient to prevent the potential uncovering of a fuel assembly in transit. In anticipation of such an event, the licensees developed an abnormal occurrence procedure for safely storing a fuel assembly under water if one was positioned above the vessel flange level during a loss of the refueling cavity water.

Question

GSI 137 addresses rapid reactor cavity drain down due to cavity seal failure and the possibility of associated spent fuel pool drain down and the uncovering of stored spent fuel. The EPR design includes a welded reactor cavity seal ring which provides protection against potential loss of refueling water inventory through a seal failure. However, there is no discussion in the EPR FSAR addressing the following GSI 137 related issues:

1. A unique feature of the EPR design is the inclusion of a reactor cavity access room and door which facilitates work on the reactor vessel head (see Figure 12.3-2, “Reactor Cavity at the +17 Ft Elevation of the Reactor building”). However, given that the door is located at the bottom of the refueling pool the potential for rapid water inventory loss exists, should the door fail (due to damage from unintentional collisions with the reactor vessel head or internals, for example). Therefore, in accordance with the requirements of GDC 61, provide additional detail on the cavity door and access room design as well as a description of the proper use of the cavity door during refueling operations to provide reasonable assurance that this cavity access point will not serve as a point of significant inadvertent inventory loss.
2. Describe the design features of the reactor cavity door that would prevent leakage of refueling water into the access room. In the event of leakage into this room, provide information on where this leakage will be directed once it enters the access room, such that systems in proximity to the room will not be affected, and releases and contamination will be controlled in accordance with 10 CFR 20.1406 and GDC 61.
3. In addition to the reactor cavity access room door, identify any other penetrations to the reactor cavity and describe the associated design features that would prevent inadvertent cavity drain down through these penetrations.
4. Should the reactor cavity undergo rapid inadvertent drain down during refueling operations when a spent fuel assembly is positioned above the reactor vessel flange level, provide information on where a licensee could safely store a spent fuel assembly
5. The U.S. EPR FSAR Tier 2, Section 12.3.1.8.1, Reactor Building, states that an access room has been incorporated into the EPR design that allows workers to access the reactor cavity floor and reactor vessel head during refueling. The intent of the door is to facilitate worker access to the reactor vessel head. FSAR Tier 2, Section 12.3.1.8.1, “Reactor Building,” states that this access room is equipped with double doors to prevent workers from entering the reactor cavity. To demonstrate compliance with GDC 61, provide information on the dose rates inside the access room and directly outside the access room should a spent fuel assembly be dropped on the cavity floor in close proximity to the access door (assuming the dropping of a maximum burnup assembly). Also provide a listing of the maximum dose rates in these areas during normal refueling operations assuming no dropped spent fuel rods. Provide information on the design controls incorporated into the room to prevent unauthorized access to the room itself and to the reactor cavity as well as to ensure unimpeded egress from the cavity and from the access room, in accordance with the requirements of 20.1601 or 20.1602 and the guidance of RG 8.38. Revise Section 12.3 of the FSAR to include information on the most restrictive radiation zone associated with this room during refueling as well as the information requested above on access controls.
6. If a design incorporating a reactor cavity floor access room is in use at any currently operating plants, describe any operating experience which would justify the use of such a design.