

ArevaEPRDCPEm Resource

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Subject: Draft - U.S. EPR Design Certification Application RAI No. 405(4691,4724,4674), FSAR Ch. 3 PHASE 4 RAI
Attachments: Draft RAI_405_CHPB_4691_4724_4674.doc

Attached please find draft RAI No. 405 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. 405(4691, 4724, 4674), Revision 1

5/14/2010

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 11.02 - Liquid Waste Management System

SRP Section: 11.03 - Gaseous Waste Management System

SRP Section: 11.05 - Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems

Application Section: 11.2

QUESTIONS for Health Physics Branch (CHPB)

11.02-22

PHASE 4 RAI

Follow-up to Open Item RAI 301, Question 11.02-17(5)

In the response dated March 31, 2010, the applicant provides information addressing staff questions on offsite radiological impacts associated with the postulated failure of a LWMS radwaste tank. A review of the information indicates that the approach and assumptions used are not consistent with SRP 11.2 and BTP 11-6. Specifically, the applicant is requested to address the following issues and revise the response and FSAR accordingly. The issues are:

1. For the tank failure scenario, it is not clear as to why the evaluation assumes the entire inventory of five tanks (two liquid storage and three concentrate tanks) when the guidance of BTP 11-6 states that the malfunction should consider the failure of one tank, with 80% of its inventory available for release to the environment.
2. For the radioactivity inventories presented in Table 11.02-17-6, there is no supporting information on their basis and no details are provided as to where this information can be found in the FSAR.
3. In modeling the movement of radioactivity out of the tank room into the environment, the scenario assumes that spilled liquid wastes would remain static in the room and released over one year via a protracted leak rate ($2.71E-04 \text{ ft}^3$ per second). This approach is contrary to the guidance of SRP 11.2 and BTP 11-6 which presumes a sudden failure and prompt release of radioactivity in the environment in characterizing an anticipated operational occurrence. As a consequence to this approach, the listing of radionuclides shown in Table 11.02-17-6 omits important radionuclides since the analysis considers only those with radiological half-lives greater than 30 days.

4. The scenario does not describe the mechanism through which radioactivity is assumed to reach ground water and does not discuss the types, and credits if any, taken for mitigating design features, as discussed in BTP 11-6. The evaluation should describe the postulated failure mechanism, identify the types of mitigating features that are assumed, and describe how such design features are being factored in specific aspects of the evaluation.
5. The response states that the previous results presented in FSAR Table 11.2-8 will be revised to update doses. However, the results presented in FSAR Table 11.2-8 are not expressed in doses, but rather as ratios of radionuclide concentrations in water to their respective effluent concentration limits of 10 CFR Part 20 (Appendix B, Table 2, Column 2). The information presented in the response focuses on doses to an offsite receptor using, in part, information drawn from Regulatory Guide 1.109, but no dose results are included in the response. The exposure scenario assumes fish and invertebrate consumption and shoreline activities. This approach is not consistent with SRP 11.2 and BTP 11-6 acceptance criteria. The BTP 11-6 acceptance criteria rely on compliance with the effluent concentration limits of 10 CFR Part 20 (Appendix B (Table 2, Col. 2)) at the nearest assumed source of potable water located in an unrestricted area. Note that the provisions addressing indirect human consumption (e.g., livestock watering, crop and pasture irrigation, and food processing) are for cases where surface or ground water are not used for direct human consumption under some site-specific conditions.

Also note that the NRC's draft provisions of Interim Staff Guidance (ISG-013, Fed. Reg. Vol. 75, No. 36, p.8411, 2/24/2010) for combined license applications submitted under 10 CFR Part 52 are not in effect at this time.

11.02-23

PHASE 4 RAI

Follow-up to OPEN ITEM RAI 299, Question 11.02-16(j)

In the response dated March 31, 2010, the applicant provides a revision to the noble gas effluent source term and associated offsite doses. The revision reflects a correction in the value applied for the containment low volume exhaust purge rate. The staff confirmed the resulting changes in the noble gas source terms and offsite doses using the PWR-GALE86 and GASPARD II codes. However, it was noted that the proposed markup of FSAR Table 11.3-6 did not include the sum-of-the-ratios in demonstrating compliance with the unity rule under 10 CFR Part 20 (App. B, Table 2, Col. 1) since effluent concentrations at the EAB have also changed. The applicant is requested to include in FSAR Table 11.3-6 the sum-of-the-ratios for normal and max fuel defect releases.

It should be noted that the inclusion of the sum-of-the-ratios in FSAR Table 11.3-6 had been the subject of a prior staff RAI, which is currently being tracked as confirmatory item 11.3-14(a). This is the second instance where the staff observed that a proposed revision to the FSAR does not incorporate all successive updates. This is expected to delay the staff's review and obligate the staff to track all successive changes chronologically to ensure that all prior revisions are included in the version of the FSAR being reviewed.

11.02-24

PHASE 4 RAI

Follow-up to OPEN ITEM RAI 301, Question 11.02-17

In the response dated November 5, 2009 and based on a staff audit of May 6, 2010 of a supporting AREVA dose calculation package for liquid effluent releases and doses, the applicant provides expanded offsite dose results for the maximally exposed individual. The revision includes additional information for the staff to conduct an independent evaluation of the dose results. The staff finds the additional information acceptable and independently confirmed the dose results using the LADTAP II code. Based on a review of the information provided in the response, the applicant is requested to address the following:

1. Confirm that all expanded dose results presented in Table 11.02-17-3 (p.8 and 9 of 28 in the response to Question 11.02-17) will be included in a revision of FSAR Table 11.2-6.
2. Regarding Footnote 1 of FSAR Table 11.2-5, clarify that even though the U.S. EPR is designed to operate for 60 years, the LADTAP II code parameter for the mid-point of reactor operation lifetime was left at the default value of 20 years rather than changing it to 30 years.
3. Regarding the disposition of the balance of the requested information under Question 11.02-17, the applicant is requested to confirm whether additional information will be presented in updating population doses in support of the cost-benefit analysis for the liquid waste management system.

11.03-18

PHASE 4 RAI

Follow-up to OPEN ITEM RAI 301, Question 11.03-15 and RAI 299, Question 11.02-16(j)

In responses dated November 5, 2009 and March 31, 2010, and a staff audit of May 6, 2010 of a supporting AREVA dose calculation package, the applicant provides a revision to the airborne effluent source term and updated offsite dose results for the maximally exposed individual. The revision reflects a correction in the value applied for the containment low volume exhaust purge rate, which resulted in a change in noble gas releases, and inclusion of additional information for the staff to conduct an independent evaluation of the dose results. The staff confirmed the resulting changes in the airborne effluent source term using the PWR-GALE86 code and is in general agreement with the revised offsite doses using the GASPAR II code. Based on a review of the information provided in the responses, the applicant is requested to address the following:

1. Confirm that all expanded dose results presented in Table 11.03-15-2 (p.17 and 18 of 28 in the response to Question 11.03-15) will be included in a revision of FSAR Table 11.3-5.

2. Regarding Footnote 2 of FSAR Table 11.3-4, clarify that even though the U.S. EPR is designed to operate for 60 years, the GASPARI code parameter for the mid-point of reactor operation lifetime was left at the default value of 20 years rather than changing it to 30 years.
3. Regarding the disposition of the balance of the requested information under Question 11.03-5, the applicant is requested to confirm whether additional information will be presented in updating population doses in support of the cost-benefit analysis for the gaseous waste management system.

11.05-22

PHASE 4 RAI

Follow-up to Open Item 346, Question 11.05-20

In the response dated April 1, 2010, the applicant provides information addressing the staff's questions about the instrumentation performance characteristics in complying with the U.S. EPR Technical Specifications (TS) 16.3.4.12.d and TS B16.3.4.12. The TS specifies a maximum leakage rate of 150 gallons per day (gpd) through any one steam generator (SG) using realistic primary coolant radionuclide concentrations. While the staff confirmed the results of a selected set of conditions, a review of the response and the associated calculation package (U.S. EPR Doc. No. 32-7003827-000, Rev. 14, 4/13/2009) raises additional questions. Specifically, the applicant is requested to address the following issues and revise the response and FSAR accordingly. The issues are:

1. The calculation package assesses the presence of noble gases, in addition to N-16, but the AREVA RAI response to the staff does not present this information and does not describe the associated detector response characteristics, the relationship in detector response and overlap between the two sources of external radiation, and how the derived dynamic response ranges of the instrumentation would be used in demonstrating that the 150 gpd TS criterion would be met. The applicant is requested to provide this information and describe the incremental response of the MSL radiation monitor due to noble gases alone, combined external radiation contributions of noble gases and N-16, and overlap of both sources of external radiation under varying power levels.
2. The response indicates that the external radiation exposure rate at the selected MSL radiation monitor location assumes a MSL pipe thickness of 1.9 inch. A review of FSAR Figure 10.3-1 (notes 1 or 2 depending on fig. sheet) indicates that the MSL pipe external and internal diameters are 30 and 27.5 inches, respectively. A MSL pipe wall thickness of 1.9 inch would result in a different pipe external diameter (31.3 inches) assuming a fixed internal diameter of 27.5 inches for design performance considerations. The applicant is requested to confirm the thickness of the MSL pipe applied in the calculation package in deriving the external radiation exposure rate of 3.6 uR/hr due to N-16 alone.
3. The response and calculation package indicate that a 150 gpd SG tube leak would result in an external radiation exposure rate of 3.6 uR/hr due to N-16 alone. It is not clear if the proposed MSL radiation monitoring system would detect this small incremental exposure rate in actual operation above ambient background due to both naturally occurring radioactivity and plant-induced background in the MSL pipe room. A review of FSAR Table 11.5-1 indicates that the stated dynamic response range of the MSL radiation

monitor is from 1.0E-01 to 1.0E+04 cps, based on N-16 alone. The applicant is requested to provide information demonstrating that the MSL radiation monitor is capable of detecting an incremental rise of 3.6 uR/hr at full power above ambient background radiation levels given the locations of radiation detectors, provide in FSAR Table 11.5-1 a meaningful radiological unit in expressing the dynamic response range of the MSL radiation monitors, and revise the response and proposed changes to the FSAR accordingly.

4. The proposed revision to the FSAR should include the expected main steam line radioactivity concentration at the 150 gpd TS limit in addition to the expected range. The applicant is requested to provide this information in the FSAR.
5. While the response acknowledges that some design features and operating characteristics of the MSL radiation monitoring system cannot be defined at this stage of the design certification, there is a need to alert the COL applicant of these important considerations. As a result, AREVA is requested to include a COL information item that places the responsibility on the COL applicant to provide plant-specific information describing how design features, installation, and implementation of operating procedures for this system will address compliance with the SG TS leakage rate of 150 gpd under U.S. EPR TS 16.3.4.12.d. The COL information item should address:
 - a. the representativeness of the chosen monitoring location in monitoring N-16 and noble gases in minimizing transient time and radioactive decay and cross-interferences from radiation from other MSL pipes;
 - b. type of radiation detection method, detection sensitivity for the expected radionuclide distributions and concentrations or alternate set of surrogate radionuclides, and associated calibration methods; and
 - c. placement of radiation monitoring instrumentation in plant areas that minimize interferences from all expected sources of ambient external radiation levels.

11.05-23

PHASE 4 RAI

Follow-up to Open Item 273, Supplement 4, Question 11.05-2

In the response dated March 31, 2010, the applicant provides information addressing staff questions on the implementation of the offsite dose calculation manual (ODCM) in assessing offsite from effluent releases. A review of the response and FSAR Sections 1.8.1 and 11.5 indicates that the listing of COL information items is incomplete. Regulatory Guide 1.206 (Section C.III.4) addresses COL information that a COL applicant is required to address because of plant and site-specific conditions that cannot be described at the design certification stage. In this context, the staff has determined that the following COL information items should be added to the FSAR. The COL information items are:

1. The COL applicant is responsible for deriving PERMSS subsystem's lower limits of detection or detection sensitivities, and set-points (alarms and process termination/diversion) for liquid and gaseous process radiation monitoring equipment not

covered by the ODCM based on plant and site-specific conditions and operating characteristics of each installed radiation monitoring subsystem.

2. The COL applicant is responsible for the development of a plant-specific process and effluent radiological sampling and analysis plan for systems not covered by the ODCM, including provisions describing sampling and analytical frequencies, and radiological analyses for the expected types of liquid and gaseous samples and waste media generated by the LWMS, GWMS, and SWMS.
3. The COL applicant is responsible for providing plant-specific information describing how design features and implementation of operating procedures for the PERMSS will address the requirements of 10 CFR Part 20.1406(b) and guidance of SRP Section 11.5, Regulatory Guides 4.21 and 1.143, IE Bulletin 80-10, ANSI/HPS-13.1-1999 and ANSI N42.18-2004, and NEI 08-08 for PERMSS subsystems that rely on or augmented with the installation and operation of skid-mounted radiation monitoring and sampling systems connected to permanently installed radioactive process and waste management systems.

11.05-24

PHASE 4 RAI

Follow-up to Open Item 276, Supplement 1, Question 11.05-14

In the response dated Nov. 6, 2009, along with discussions held with the applicant during the audit of March 24, 2010, the applicant provides information addressing staff questions about inconsistent descriptions supporting the design basis of PERMSS subsystems. A review of the response indicates that the new information is incomplete for all items. Specifically, the responses do not provide adequate details for the staff to evaluate and conclude with reasonable assurance that the revised FSAR sections will include an updated listing of the design basis. In addition, the proposed revisions to FSAR Table 9.3.2-1 (Primary Side Sampling Points) and Table 9.3.2-2 (Secondary Side Sampling Points) identify process measurements as "activity" with no other qualifiers. The table entries, under process measurement, should describe the type radiological analyses that would be conducted and which default or surrogate radionuclides would be analyzed for the listed process and blowdown streams. Also, the systems listed for the secondary side should be reviewed for completeness in considering whether the turbine building drains system, main condenser evacuation system, and turbine gland sealing system should be included as well in Table 9.3.2-2.

11.05-25

PHASE 4 RAI

Follow-up to OPEN ITEM RAI 273, Question 11.03-13

In the response dated March 31, 2010, the applicant provides new information and proposes the addition of Table 11.3-10 addressing the staff's request in including a failure analysis for the GWMS in FSAR Section 11.3. With respect to the evaluation of offsite radiological impacts associated with an operator error leading to an inadvertent release of radioactivity from the GWMS via a bypass, the staff's evaluation revealed that there is not enough information provided in FSAR Section 11.3.3.6 and RAI response for the staff to conduct an independent

confirmation that the postulated event will not result in a dose greater than 100 mrem at the EAB. The applicant is requested to provide information on the origin of the radioactivity within the GWMS, radioactive source term assumed to be released, and the atmospheric dispersion parameter applied at the EAB. The staff needs this information for the purpose of confirming that the consequences of the postulated GWMS failure complies with the acceptance criteria of SRP Section 11.3 and BTP 11-5 of NUREG-0800 and guidance of RG 1.206.