ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Saturday, May 21, 2011 3:43 PM
To: 'usepr@areva.com'
Cc: Sastre, Eduardo; Terao, David; Hearn, Peter; Clark, Phyllis; Colaccino, Joseph
Subject: Draft - U.S. EPR Design Certification Application RAI No. 492 (5815), FSAR Ch. 9
Attachments: Draft RAI_492_CIB2_5815.doc

Attached please find draft RAI No. 492 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,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
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Created By: Getachew.Tesfaye@nrc.gov

Recipients:
"Sastre, Eduardo" <Eduardo.Sastre@nrc.gov>
Tracking Status: None
"Terao, David" <David.Terao@nrc.gov>
Tracking Status: None
"Hearn, Peter" <Peter.Hearn@nrc.gov>
Tracking Status: None
"Clark, Phyllis" <Phyllis.Clark@nrc.gov>
Tracking Status: None
"Colaccino, Joseph" <Joseph.Colaccino@nrc.gov>
Tracking Status: None
"'usepr@areva.com'" <usepr@areva.com>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

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Request for Additional Information No. 492(5815), Revision 0

5/21/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.03.04 - Chemical and Volume Control System (PWR) (Including Boron Recovery System)
Application Section: 9.3.4

QUESTIONS for Component Integrity, Performance, and Testing Branch 2 (ESBWR/ABWR Projects) (CIB2)

09.03.04-21

The response to RAI 125, Questions 9.03.04-18 identified the EPRI Primary Water Chemistry Guidelines as the reference document for parameters and frequency of sampling for the US EPR designs. The applicant further responded in RAI 125, Question No. 09.03.04-18 that recent research indicates that although there are advantages to higher hydrogen concentrations in the RCS, the disadvantages are more important.

The Staff finds that to date there has been no reports of these disadvantages occurring from any plants using hydrogen concentrations in the range of 35-50 cc/kg. The hydrogen concentration in the RCS is a control parameter associated with Action Level I lower limit of 25 cc/kg. One of the main purposes of maintaining a significant hydrogen 'buffer' over a minimum hydrogen concentration is for mitigation of oxygen intrusion into the RCS. All make-up and borated water sources that provide direct feed to the RCS are saturated with oxygen. Thus the lower limit of 25 cc/kg has been used to ensure that oxygen ingress, especially during intervals of large volume make-up, does not go unabated.

Rev 2 of the EPR FSAR Tier 2, 9.3.4 still references the EPRI PWR Primary water chemistry guidelines Rev 6. Hydrogen control is a "shall" requirement in the EPRI guidelines. In addition, the NEI guidance on this issue is as follows (from a letter dated December 2, 2003 from Lawrence Womack, Chair of the Steam Generator Management Program for EPRI):

> Guideline elements designated as shall are important to long-term steam generator reliability but could be subject to legitimate deviations due to plant differences and special situations. Deviations shall be based on careful consideration by the responsible utility and independent review and concurrence of the justification by the NEI Review Board. Concurrence from the review board should be sought prior to implementing a deviation. However, in the event that operational need require immediate implementation of a deviation, utilities may act independently on a one-time basis provided they submit their justification for the deviation to the Review Board within 30 days. Concurrence from the Review Board will permit continued use of the deviation.

The current revision of the FSAR does not address this issue satisfactorily.

For these reasons, the Staff requests the applicant to provide a more rigorous technical evaluation of the hydrogen control range that demonstrates the acceptability of maintaining the RCS hydrogen below the EPRI Guidelines Action Level 1 limit.

09.03.04-22

RAI 200, Question 09.03.04-19 Parts 1, 2, and 3 and RAI 125, Question 09.03.04-16 Part 3 asked the applicant to describe how nitrogen that is continuously purged through the VCT would prevent build up of ammonia and control hydrogen by this continuous nitrogen feed and bleed process in the RCS. The responses to Question 1, 2a and b of RAI 200, Question 09.03.04-19 are impacted by this description as well. In a subsequent response to the question in RAI 200, Question 09.03.04-19, the applicant stated:

> "The hydrogen is collected in the top head of the gas separator and educted by the water jet pump and discharged into the letdown stream. The RCS hydrogen concentration depends on the hydrogen partial pressure in the gas separator and the back pressure applied to the gas by the over pressure maintained in the Volume Control Tank."

This explanation indicates that the measurement of hydrogen concentration will be based on the partial pressure in the gas separator and the VCT back pressure. However, both the VCT and the gas separator will also be saturated with nitrogen gas. The question of how the exact concentration of hydrogen will be determined is not evident in this explanation. The staff finds that the applicant has not fully described the exact mechanism of how nitrogen purging of the VCT maintains hydrogen concentration in the RCS.

For this reason, the Staff requests the applicant provide a description of the mechanism and what equations would be used to determine the theoretical hydrogen concentration in the RCS.

09.03.04-23

RAI 200, Question 09.03.04-19 Part 3 indicated that the equilibrium concentration of ammonia and its effect on demineralizer performance are to be provided at a future date (later in the design process)

Therefore, the Staff request the applicant to describe the effect of ammonia build on the RCS demineralizer performance.

09.03.04-24

The applicant's response to RAI 125, Question 09.03.04-15 Parts 1 and 2 indicated that demineralizer resins will be purchased in the lithiated form. The information provided in

Response #1 to this RAI is contrary to the statement in section 9.3.4.2.1 of the licensee submittal:

> "Both ion exchangers are initially charged with the same quantity of resin in the form of H^+ and OH^-. One ion exchanger is saturated with lithium and boron. After an equilibrium concentration is reached, this ion exchanger serves as the main purification ion exchanger. The other ion exchanger removes cesium and excess lithium produced in the RCS."

The applicant stated in response to the RAI that the FSAR will not need to be changed.

Rev 2 of the EPR FSAR Tier 2, 9.3.4 has not been changed to reflect the fact that the applicant intends to purchase lithiated mixed bed ion exchanger rather than perform the lithiation process *in situ*. The current description in the FSAR would have the plant changing out a mixed bed demineralizer during power operation, and performing an *in situ* equilibration by addition of lithium into the RCS. This process description is not done at *any* PWR.

Therefore, the Staff requests that the applicant change the FSAR Section 9.3.4.2.1 to match the response to RAI Question 09.03.04-14 parts 1 and 2.

09.03.04-25

RAI 200, Question 09.03.04-20 requested that a pre-operational functional test of the evaporator system demonstrating its capabilities be performed. The applicant responded that such a test, "will be requested as part of the supplier's functional shop testing (or equivalent) prior to owner equipment acceptance and release for shipment (to the site)."

Therefore, the Staff requests that the applicant describe the pre-operation functional test of the evaporator system in the FSAR.

09.03.04-26

RAI 200, Question 09.03.04-20 the staff requested that a calculation be provided that demonstrates that the ^{10}B concentration will not be depleted during the 1-year interval between confirmative analytical results while water is being reprocessed. The applicant replied, "frequency for determining the B-10 assay (atom %) will be identified later in the design process."

The Staff requests that the applicant describe the method for determining the ^{10}B assay frequency in the FSAR.