NRR-PMDAPEm Resource

From: Mozafari, Brenda
Sent: Monday, June 23, 2014 2:05 PM
To: Nicely, Ken M.:(GenCo-Nuc) (ken.nicely@exeloncorp.com)
Subject: FW: Draft RAI from TAC NOS.: MF2489 AND MF2490 review on NEUTRON ABSORBING INSERTS

Ken,

Additional RAI -

By letter dated July 16, 2013, (Agencywide Documents Access and Management Systems Accession Number [ADAMS] ML13199A037), Exelon Generation Company, LLC. (the licensee), submitted a license amendment request to revise the Quad Cities Nuclear Station, Units 1 and 2 Technical Specifications to support use of neutron absorbing inserts in spent fuel pool.

REQUEST FOR ADDITIONAL INFORMATION QUAD CITIES NUCLEAR POWER STATIONS, UNITS 1 AND 2 REGARDING USE OF NEUTRON ABSORBING INSERTS
IN SPENT FUEL STORAGE RACKS
DOCKET NOS.: 50-254 AND 50-265
TAC NOS.: MF2489 AND MF2490

1. RAI 1-3 indicated that it was possible for a coupon to degrade without failing the minimum areal density criteria, and requests further detail on how the surveillance program will guarantee that any degradation is addressed before the safety function of the inserts installed in the SFP is affected. The response briefly summarizes the planned testing and states that any changes in the material properties will be identified early. NRC staff interprets the response to imply that the intent of the surveillance program is to identify when degradation occurs and use the Corrective Action Program to address any degradation. As such, the goal of the proposed surveillance program is to confirm that degradation is not occurring, not to verify the acceptability of any degradation. If this interpretation is correct, then the acceptance criteria for the B-10 areal density in Table 3.9-3 in Attachment 1 to the License Amendment Request letter transmitted to the NRC on July 16, 2013 is not consistent with the intent of the surveillance program. A minimum areal density value is provided, but no criterion associated with a possible change in areal density is included. Please update Table 3.9-3 with an appropriate criterion, or explain why a minimum areal density value for the coupon is sufficient as an acceptance criterion for verifying acceptable performance of all inserts in the SFP.

2. In the spent fuel pool (SFP), the spent fuel stored in the racks must comply with the regulations to remain subcritical. In the case of Quad Cities, they are licensed under 10 CFR 50.68 “Criticality Accident Requirements.” This regulation states that:

   If no credit for soluble boron is taken, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with unborated water.

   To demonstrate compliance with the regulation, the licensee has performed a nuclear criticality safety (NCS) analysis of record (AOR). In this NCS AOR, Quad Cities has credited neutron absorber material (NAM) in the analysis to help maintain subcriticality. In order to ensure that the NAM will remain within the assumptions used in the NCS AOR, a Surveillance Program to identify and monitor any degradation

is in place or is planned to be implemented in the near future. These programs will confirm that the NAM will perform as designed for in the NCS AOR.

The staff questions the amount of information described in Quad Cities' proposed Technical Specifications (TS) in regard to the NAM and its Surveillance Programs. In particular, NAM need to be monitored and degradation mitigated in the SFP to ensure that the assumptions in the SFP NCS AOR and thereby the TS 4.3.1 are not challenged. Since the materials are integral to the compliance of the TS 4.3.1 and the regulations, the requirement to monitor the NAM should be reflected in the TS in addition to the areal density of the NAM.

Please provide a TS Surveillance for the SFP NAM that will confirm that the materials will perform as designed for in the NCS AOR.

Note: In justification for having a neutron absorbers and its surveillance programs in TS, please see 10 CFR 50.36 (c)(2)(ii)(B), where it states:

Criterion 2. A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Furthermore 10 CFR 50.36(c)(2)(ii)(C) states:

Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that wither assumes the failure of or presents a challenge to the integrity of a fission product barrier.

3. RAI 1-17 requested justification for the use of a code that had not yet been submitted for review by the NRC for reload analysis methods with the SVEA-96 Optima2 fuel assembly, in order to obtain isotopic data for use in the criticality analyses. No specific information was provided to allow NRC staff to determine if CASMO-4 isotopic composition predictions are acceptable for SVEA-96 type lattices. NRC staff agrees that for the most part, the SVEA-96 lattice is comparable to other fuel lattices already approved for use with CASMO-4 in the U.S. However, the water wings are a relatively unique feature, and the SVEA-96 calculation results show a much larger bias between CASMO-4 and MCNP than the GE14 calculations. Appendix C shows the difference between CASMO-4 and MCNP5 calculations to be less than two sigma for the GE14 fuel design, while comparison of Tables 7.1(a) and 7.2(a) shows that the difference can approach the 20-sigma threshold for the SVEA-96 fuel design. This suggests that the heterogeneities of the SVEA-96 Optima2 fuel lattice may require special modeling considerations or treatment that is substantially different from that of other fuel assembly designs. Please provide evidence that the CASMO-4 code would be expected to compute isotopic quantities comparable to codes previously approved by the NRC for use in reload analysis of SVEA-96 Optima2 fuel.

4. The response to the RAIs does not appear to include an updated version of the proposed amendments to the Quad Cities Technical Specifications. The license amendment request (LAR) letter submitted on July 13, 2013 proposes the addition of TS 4.3.1.1.c, "The combination of U-235 enrichment and gadolinia loading shall be limited to ensure fuel assemblies have a maximum k-infinity of 0.9131 as determined at 4°C (39.2°F) in the normal spent fuel pool in-rack configuration…" The k-infinity value of 0.9131 is from an earlier version of the criticality analysis that used a "super-lattice." Since the "super-lattice" has been withdrawn, please update TS 4.3.1.1.c to use the limiting k-infinity value from the most recent version of the criticality analysis (0.8991) or provide a rationale for use of the 0.9131 value.

5. In the response to RAI 1-11, part b, there is a statement that any future reconstitutions will be explicitly modeled to "confirm they are bounded by the HI-2125245 analysis and will be processed under 50.59." However, no methodology is given in HI-2125245 for modeling reconstitutions or dealing with any biases or uncertainties specific to reconstituted fuel. As such, modeling of reconstituted fuel would meet the criteria of 10 CFR 50.59(c)(2)(viii) requiring a request for a license amendment pursuant to 10 CFR

50.90. If the licensee intends to use the 50.59 process to qualify future reconstituted fuel, please provide a description of the methodology that will be used to model reconstituted fuel, including any new assumptions, biases, or uncertainties.

If you require a call for clarification, let me know as soon as possible. Otherwise I will plan for a final response by July 28, 2014.

Thanks

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