NRR-PMDAPEm Resource

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Sent: Monday, November 28, 2016 4:00 PM
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Subject: Final Request for Additional Information - Duane Arnold Energy Center - LAR - SFP Criticality - MF7486

By letter dated March 15, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16077A234), NextEra Energy Duane Arnold submitted a License Amendment Request (LAR) for the Duane Arnold Energy Center. The proposed amendment would revise Technical Specification 4.3.1, "Fuel Storage, Criticality," and TS 4.3.3, "Fuel Storage, Capacity," to reflect an updated current licensing basis for the facility, as well as add a new requirement in TS 5.5, "Programs and Manuals," for a Spent Fuel Pool (SFP) neutron absorber monitoring program.

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed a nuclear criticality safety analysis that was included with the LAR to demonstrate that NRC requirements associated with SFP subcriticality will be met. The staff sent draft Requests for Additional Information (RAIs) to the licensee via email on September 21, 2016 (ADAMS Accession No. ML16267A064), to address potential non-conservatisms in the analysis. Subsequent teleconferences were conducted with the licensee on September 26, 2016, and October 4, 2016, to clarify the RAIs and determine the best approach for a timely resolutions of the issues identified in the RAIs. The staff agreed on a subset of the RAIs that, if adequately addressed, would be sufficient to allow the staff to make a safety determination on this LAR. The licensee committed to develop draft RAI responses, and to support an audit to allow the staff to determine whether the RAI responses are adequate to address the most significant issues. The staff noted that upon completion of the audit, the draft RAIs would be revised as necessary and issued as final, and the licensee would be expected to provide the needed information on the docket.

On November 14, 2016, the audit plan was electronically transmitted (ADAMS Accession No. ML16327A093). The NRC staff conducted the audit on November 21, 2016, at the NextEra office in Jupiter, Florida. The licensee staff provided the requested documentation and material which was helpful in determining the path forward in finalizing the request for the additional information, which is listed below.

Please provide your response to this information on the docket, no later than 30 days from the receipt of this email.

REQUESTS FOR ADDITIONAL INFORMATION

The applicable 10 CFR 50.68 requirement is that the k-effective of the spent fuel pool (SFP) 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. NextEra Duane Arnold, LLC submitted a criticality analysis (Enclosure 4 to the license amendment request (LAR)) performed to demonstrate that this regulatory limit will be met if the proposed Technical Specification (TS) limit on the reactivity for fuel stored in the Duane Arnold Energy Center (DAEC) SFP is satisfied. The staff has identified some instances where it is not clear if the reactivity impact due to specific conditions was adequately addressed in the criticality analysis. The potential reactivity impacts may be positive, so the staff needs additional information to verify the regulatory limit will not be challenged by these potential impacts.

1. The proposed TS 4.3.1.1.a revision provides an updated value for the Standard Cold Core Geometry (SCCG) k-infinity limit applicable to the Programmed and Remote Systems Corporation (PaR) SFP racks. The TS is silent regarding which code is to be used to calculate this value, but the DAEC UFSAR

indicates that the lattice code used in licensing applications is TGBLA. Please clarify if the SCCG k-infinity values used for comparison to the TS 4.3.1.1.a limit are to be calculated using TGBLA or CASMO-4, and:

a. If TGBLA is to be used, describe why the analysis performed based on CASMO-4 as described in Enclosure 4 to the LAR would be applicable to SCCG k-infinity values as calculated by TGBLA. Include any considerations due to code-to-code biases and uncertainties.
b. If CASMO-4 is to be used, describe how the licensing basis and QA control program for DAEC will be updated to reflect this intention.

2. Section 5.1.2 of Enclosure 4 to the LAR states that for the MCNP6 calculations, "[t]he initial source is placed in the highest reactive area of the model." Please clarify how the source distribution was established for different calculations, including the interface and accident conditions. In particular, discuss whether a single point source, multiple point sources, or a distributed source was used.

3. Section 6.1 of Enclosure 4 to the LAR discusses sensitivity studies performed to determine limiting conditions to use for depletion. Please confirm that the k-infinity values obtained to determine the reactivity changes are the peak reactivity values from each depletion calculation performed as part of the sensitivity studies.

4. The sensitivity studies documented in Section 6.1 of Enclosure 4 to the LAR appear to have been performed using controlled conditions, and only consider the reactivity impact to the SCCG k-infinity. Please discuss why the results from the sensitivity study would be expected to remain applicable for uncontrolled conditions, and how the determination of limiting depletion conditions for determination of the maximum SCCG k-infinity would translate to limiting depletion conditions for determination of a limiting bound on the correlation between the SCCG k-infinity and the rack k-infinity.

5. Section 6.6 to Enclosure 4 to the LAR discusses calculations performed to assess the impact of eccentric positioning or rotation of fuel assemblies in the SFP rack cells. The report indicates that the calculations used the base model, which the NRC staff interprets to mean that the limiting GNF2 lattice described in Section 6.4 was used, which was based on an unrodded depletion at 0% void. The radial burnup distribution for the fuel lattice may have a significant impact on these configurations, and control rod insertion would significantly change the radial burnup distribution. There is not sufficient information to evaluate the potential reactivity impact and how it might be offset by any reduction in peak reactivity due to the use of different depletion conditions. Please provide further information regarding the expected reactivity impact for eccentric positioning or rotation in the SFP cells of fuel that has been located in controlled core locations.

6. Section 6.7 of Enclosure 4 to the LAR describes an analysis performed to account for potential blistering on the Boral panels. This possibility is considered to be bounded by the complete displacement of the water between the Boral panels and the surrounding SFP cell walls. Section 9.1.2.2.2 of the DAEC UFSAR indicates that the PaR racks were manufactured in such a way that "[t]he outer can is formed into the inner can at the ends and totally seal welded to isolate the Boral from the pool water." This discussion appears to describe that of an unvented, completely encased installation of the Boral panels in the PaR cell walls. Please discuss whether the UFSAR description is an accurate reflection of the current SFP rack configuration. If it is, Information Notices 1983-29 and 2009-26 describe past incidents where Boral-containing SFP cell walls with this type of configuration experienced issues with bulging. Please address the potential for moderator displacement due to cell wall bulging.

7. Section 6.8 of Enclosure 4 to the LAR discusses the interface between racks. For the interface between PaR racks and the Holtec racks, the criticality analysis report states, "[t]he density of the fuel pellet in the Holtec rack was reduced by 23% so the infinite k_{eff} of both racks was approximately the same…" According to the proposed TS 4.3.1.1.a, the SCCG k-infinity limit for the PaR and Holtec racks would be the same. Therefore, the same limiting fuel lattices could be loaded in both racks. If the Holtec rack configuration is more reactive than the PaR rack configuration, this may impact the interface reactivity

by increasing the neutron flux from the Holtec racks into the PaR racks. In addition, this analysis only considered normal conditions. Please provide further discussion of the interface between the PaR racks and Holtec racks, including:

a. Justification for the analysis approach discussed in Section 6.8 to capture the reactivity impact of the interface condition.
b. Potential impacts due to any postulated accident conditions in the licensing basis for both racks, such as a missing Boral panel from either rack.

8. Section 6.10 of Enclosure 4 to the LAR discusses the accident conditions that were considered in the criticality analysis. If a Boral panel is missing at the time that the SFP rack module is installed in the SFP, this would become part of the normal condition rather than an accident condition. The NRC staff is not aware of accidents that may result in movement of an entire Boral panel out of the SFP racks. Please clarify the intent for inclusion of this scenario as a potential accident condition, and if necessary, provide information demonstrating how inadvertent non-installment of a Boral panel was precluded from occurring.

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