

November 8, 2016

MEMORANDUM TO: David J. Wrona, Chief  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

FROM: Robert G. Lukes, Chief **/RA/**  
Nuclear Performance & Code Review Branch  
Division of Safety Systems  
Office of Nuclear Reactor Regulation

SUBJECT: NUCLEAR REGULATORY COMMISSION PLAN FOR THE AUDIT OF  
DUANE ARNOLD ENERGY CENTER, REGARDING DRAFT  
REQUEST FOR ADDITIONAL INFORMATION RESPONSES  
RELATING TO THE LICENSE AMENDMENT TO REVISE  
TECHNICAL SPECIFICATIONS FUEL STORAGE REQUIREMENTS  
(CAC NO. 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, 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. Upon completion of the audit, the draft RAIs will be revised as necessary and issued as final, and the licensee would be expected to provide the needed information on the docket.

CONTACT: Scott T. Krepel, NRR/DSS  
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D. Wrona

-2-

This letter documents the NRC staff's plan to perform a regulatory technical audit of NextEra Energy Duane Arnold's draft RAI responses to determine if any further information will be needed to support a timely completion of the LAR review process.

The enclosed audit plan outlines the process that the NRC staff will follow.

Docket No.: 50-331

Enclosures:

1. Audit Plan
2. Draft Requests for Additional Information

D. Wrona

-2-

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NRR-106

Office	DSS/SNPB	DSS/SNPB: BC
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Date	11/8/2016	11/8/2016

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**U.S. NUCLEAR REGULATORY COMMISSION PLAN FOR THE AUDIT OF**  
**DUANE ARNOLD ENERGY CENTER,**  
**REGARDING DRAFT REQUEST FOR ADDITIONAL INFORMATION RESPONSES**  
**RELATING TO THE LICENSE AMENDMENT TO REVISE**  
**TECHNICAL SPECIFICATIONS FUEL STORAGE REQUIREMENTS**  
**DUANE ARNOLD ENERGY CENTER**  
**DOCKET NO. 50-331**

**BACKGROUND AND AUDIT BASIS**

By letter dated March 15, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16077A234), NextEra Energy Duane Arnold, the licensee, submitted a License Amendment Request (LAR) for the Duane Arnold Energy Center. The proposed amendment would revise Technical Specification (TS) 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, 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.

Since this subset of RAIs must be satisfactorily addressed to allow the staff to base a safety finding without requiring further information, the licensee committed to developing draft RAI responses and to support this audit. The purpose of this audit is to allow the NRC staff to review the licensee's draft RAI responses and determine if the responses from the licensee will be adequate. This was determined to be the most efficient approach toward a timely resolution of this LAR review, since the staff will have an opportunity to verify that no further rounds of RAIs will be necessary and no unnecessary burden will be imposed by requiring the licensee to address issues that are no longer necessary to make a safety determination.

Upon completion of this audit, the staff and licensee are expected to make any needed revisions to the draft RAIs and RAI responses to ensure that the information provided will be sufficient to allow the staff to complete the LAR review. The final RAIs will be issued soon after the audit, with an expected response being delivered by the licensee by mid-January.

**ENCLOSURE 1**

## **REGULATORY AUDIT SCOPE AND METHODOLOGY**

The areas of focus for the regulatory audit is the information that will be requested by the NRC staff as part of a series of RAIs. The draft RAIs are included as Enclosure 2, but the final RAIs may be different based on any additional information that is determined to be necessary as a result of this audit. The audit will be conducted and completed over the course of one day.

## **INFORMATION AND OTHER MATERIAL NECESSARY FOR THE REGULATORY AUDIT**

The information required for the audit is the licensee's draft responses to the draft RAIs in Enclosure 2.

## **NRC AUDIT TEAM**

Title	Team Member	Affiliation
Team Leader, NRR/DORL	Mahesh Chawla	NRC
Technical Lead, NRR/DSS	Scott Krepel	NRC

## **LOGISTICS**

The audit will be conducted on November 21, 2016, at the NextEra engineering offices in Jupiter, FL. The licensee will provide four (4) paper copies of the draft RAI responses for the NRC staff's use during the audit. If there is any supporting documentation that may be useful for elaboration and/or clarification of the information provided in the draft RAI responses, the licensee should make it available on demand (paper copy or electronic copy on a licensee-provided laptop are both satisfactory).

Key licensee personnel involved in the development of the draft RAI responses should be made available to respond to any questions from the NRC staff. A conference room should be provided for use by the NRC staff during the audit.

## **DELIVERABLES**

The NRC team will develop an audit summary report to convey the audit results. The report will be placed in ADAMS within 30 days of the completion of the final audit session. The NRC will also finalize the RAIs as soon as feasible, and issue them to the licensee.

The information discussed in the audit may be included, fully or in part, in the development of the NRC technical staff's assessments as a result of this review.

## **DRAFT REQUESTS FOR ADDITIONAL INFORMATION**

The applicable *Code of Federal Regulations* 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 Updated Final Safety Analysis Report (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 Quality Assurance 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.

**ENCLOSURE 2**

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 U.S. Nuclear Regulatory Commission 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.