From: James Kim
Sent: Wednesday, February 28, 2024 5:01 PM
To: Hasanat, Abul M:(Constellation Nuclear)
Cc: Theo Edwards; Hawes, Mark:(Constellation Nuclear)
Subject: Final ARCB RAI regarding FitzPatrick Amendment to Update the Fuel Handling Accident Analysis (EPID: L-2023-LLA-0109)
Attachments: ARCB Revised RAIs JAF Fuel Handling Accident EPID L-2023-LLA-0109.docx

SUBJECT: FitzPatrick - Final ARCB RAI regarding Amendment to Update the Fuel Handling

Accident Analysis (EPID: L-2023-LLA-0109)

Mr. Hasanat,

By letter dated August 3, 2023 (Agencywide Documents Access and Management System (ADAMS) Accession ML23215A012), Constellation Energy Generation, LLC (CEG) submitted an amendment to revise the James A. FitzPatrick Nuclear Plant fuel handling accident analysis and technical specification bases definition of recently irradiated fuel to account for changes to the analyses in support of the transition from the refuel bridge mast NF-400 (*i.e.,* triangular mast) to the new NF-500 mast.

The NRC staff has determined that additional information is needed to complete its review of the amendment. On February 14, 2024, the NRC staff sent FitzPatrick the draft Request for Additional Information (RAI) from the Radiation Protection & Consequence Branch (ARCB). On February 26, 2024, the RAI clarification call was held between the NRC and FitzPatrick staff and determined that a revised draft RAI was needed. On February 27, 2024, the NRC staff sent the revised draft RAI to FitzPatrick. On February 28, 2024, FitzPatrick notified that no clarification call was required and agreed to provide the RAI responses by March 29, 2024. A publicly available version of this final RAI (attached) will be placed in the NRC's ADAMS.

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OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR ADDITIONAL INFORMATION
REGARDING ACCIDENT DOSE ANALYSIS DESCRIBED IN
LICENSE AMENDMENT REQUEST TO UPDATE THE TECHNICAL SPECIFICATION BASES
TO CHANGE THE FUEL HANDLING ACCIDENT ANALYSIS LICENSE AMENDMENT FOR
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
DOCKET NOS. 50-333
(ENTERPRISE PROJECT IDENTIFICATION NUMBER EPID: L-2023-LLA-0109

By letter dated August 3, 2023 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML23215A012), Constellation Energy Generation, LLC (CEG) submitted to the U.S. Nuclear Regulatory Commission (NRC) a license amendment request (LAR) to update the Technical Specification Bases to change the fuel handling accident analysis.

Additional information is needed for the NRC staff to continue its review of this LAR.

The NRC staff is reviewing the LAR using the following regulations and guidance:

> Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50.67(b) states, in part, the following:
>
> > [a] licensee who seeks to revise its current accident source term in design basis radiological consequence analyses shall apply for a license amendment under § 50.90. The application shall contain an evaluation of the consequences of applicable design basis accidents previously analyzed in the safety analysis report.

Regulatory Analysis Basis

1. Section 10 CFR Part 50.67, "Accident Source Term," allows licensees seeking to revise their current accident source term in design basis radiological consequence analyses to apply for a license amendment under § 50.90. The application shall contain an evaluation of the consequences of applicable design basis accidents previously analyzed in the safety analysis report. Section 50.67(b)(2) requires that the licensee's analysis demonstrates with reasonable assurance that:

   (i) An individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release, would not receive a radiation dose in excess of 0.25 Sv (25 rem) total effective dose equivalent (TEDE).

   (ii) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage), would not receive a radiation dose in excess of 0.25 Sv (25 rem) TEDE.

   (iii) Adequate radiation protection is provided to permit access to and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 0.05 Sv (5 rem) TEDE for the duration of the accident.

2. Section 10 CFR Part 50, Appendix A, “General Design Criterion (GDC) for Nuclear Power Plants”: GDC 19, requires that a control room be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. It also states that adequate radiation protection is provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident.

3. NUREG-0800, Standard Review Plan (SRP) Section 6.4, “Control Room Habitability System,” Revision 3, March 2007; Section 6.5.2, “Containment Spray as a Fission Product Cleanup System,” Revision 4, March 2007; and Section 15.0.1, “Radiological Consequences Analyses Using Alternative Source Terms,” Revision 0, July 2000.

4. NRC Regulatory Guide (RG) 1.183, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors,” July 2000 (ADAMS Accession No. ML003716792).

RAI ARCB #1

<u>Background</u>:

In section 1.0 Purpose, of the document “CALCULATION NO. JAF-CALC-RAD-04410” as provided in “Supplemental Information for License Amendment Request to Update the Technical Specification Bases to Change the Fuel Handling Accident Analysis” Dated August 31, 2023, three time frames are described for fuel handling accident analysis. The shortest timeframe for analysis of a fuel handling accident is “0 to 24 hours.” In the current licensing basis, a minimum of 96 hours is identified as the minimum amount of decay time required before fuel can be removed from the core.

<u>Question</u>:

Throughout the application and the supplement there is no minimum decay time after reactor shutdown that is identified before fuel handling can commence. Please provide information as to what the minimum decay time will be for commencement of fuel handling, or where this information can be identified.

RAI ARCB #2

<u>Background</u>:

In Regulatory Guide 1.183 Appendix B, “Assumptions for Evaluation the Radiological Consequences of a Fuel Handling Accident”, Section 1 Source Term it states:

> The number of fuel rods damaged during the accident should be based on a conservative analysis that considers the most limiting case. This analysis should consider parameters such as the weight of the dropped heavy load or the weight of a dropped fuel assembly (plus any attached handling grapples), the height of the drop, and

> the compression, torsion, and shear stresses on the irradiated fuel rods. Damage to adjacent fuel assemblies, if applicable (e.g., events over the reactor vessel), should be considered.

In section 2.1, Source Term of the document “CALCULATION NO. JAF-CALC-RAD-04410” as provided in “Supplemental Information for License Amendment Request to Update the Technical Specification Bases to Change the Fuel Handling Accident Analysis” Dated August 31, 2023, it is stated:

> The fraction of the core fuel damaged for GNF2, a 10x10 bundle design with 85.6 equivalent full length rods, and GNF3, also a 10x10 bundle design but with 88.32 equivalent full length rods, are based on 172 damaged fuel rods in a GNF2 fuel assembly with the NF-500 mast and 169 ruptured fuel rods in a GNF3 fuel assembly with the NF-500 mast (Reference 29).

<u>Question</u>:

Please provide further information associated with the source term for this accident analysis. Specifically, please describe the number of assemblies damaged in the postulated accident including any impacted and/or adjacent assemblies, and the number of fuel rods damaged in each fuel assembly. Please provide any necessary discussion of the items included in RG 1.183 Appendix B, Section 1.

RAI ARCB #3

<u>Background</u>:

In Regulatory Guide 1.183 Appendix B, “Assumptions for Evaluation the Radiological Consequences of a Fuel Handling Accident” Section 2 Water Depth, a minimum water level of 23 feet is required to assume a DF of 200. If the depth of water is not 23 feet, the decontamination factor will have to be determined on a case-by-case method.

In section 2.3 Pool Decontamination Factor (DF) Model of the document “CALCULATION NO. JAF-CALC-RAD-04410” as provided in “Supplemental Information for License Amendment Request to Update the Technical Specification Bases to Change the Fuel Handling Accident Analysis” Dated August 31, 2023, it is stated that the spent fuel pool water level is “normally maintained at about 21 feet 7 inches over the top of irradiated fuel assemblies seated in the spent fuel pool storage rack.” It is also stated that “an effective DF of 200 is used in this analysis.”

Current licensing basis provides a drop height of “2 feet before being stopped by the stored assemblies”, and “81 fuel rods being damaged.” The assumption of 81 rods being damaged over the SFP as opposed to the 125 damaged fuel rods over the reactor vessel is based upon drop height. Current licensing basis allows an assumed increase in DF, from a calculated 172.75 with 21 feet 7 inches of water, to a DF of 200 with the assumption of 35% less fuel rods being damaged in an event in the SFP.

The discussion for SFP DF in Section 2.3 Pool Decontamination Factor (DF) Model, points to Assumption 4.2 in the LAR. This assumption does not address number of fuel rods damaged in an accident in the SFP.

<u>Question</u>:

Please provide on the docket the justification for utilizing a DF of 200 for a fuel handling accident in the SFP. Specifically, please justify the use of a DF of 200 since the assumed number of fuel rods damaged has changed from CLB. Include in the discussion the drop height with the new mast, and the change in fuel rods damaged in this analysis (as opposed to the current licensing basis). Please modify application to note that the assumed SFP height of 21 feet 7 inches is the minimum SFP height according to technical specification 3.7.7 as opposed to normal SFP height.

Notes (not to be included in RAI, provided for discussion in any clarification call):

- The assumptions for this LAR have changed from the CLB for question 3. The licensing basis is opened up with (potential) change in fuel mast (drop height) and number of fuel rods damaged (page 8/185 of current supplement vs. page 39/207 of 2002 LAR).

- The DF does not change with number of fuel assemblies damaged. I would need the same discussion with percentage of fuel rods damaged vs increased DF. Please provide similar rational related to reduced source term/DF as provided in CLB license amendment request (pg 29/207, June 7 2002 – ML021620506)