

NRR-DMPSPEm Resource

From: Lamb, John
Sent: Monday, February 4, 2019 4:48 PM
To: Miner, Peter
Cc: Byrne, Robert M; Powers, Michael J; Couture III, Philip; Halter, Mandy
Subject: RAI - Pilgrim EP Exemption (EPID: L-2018-LLE-0011)

Importance: High

Mr. Miner:

By letter dated July 3, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18186A635), Entergy Nuclear Operations, Inc. requested an exemption from specific emergency planning requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 for the Pilgrim Nuclear Power Station (PNPS), based on the proposed permanent cessation of power operations and removal of fuel from the reactor vessel, which is expected no later than June 1, 2019. The exemption request has been reviewed against the requirements in 10 CFR 50.47, "Emergency plans," and Appendix E to 10 CFR Part 50, "Emergency Planning and Preparedness for Production and Utilization Facilities," using the guidance provided in Interim Staff Guidance (ISG) NSIR/DPR-ISG-02, "Emergency Planning Exemption requests for Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML14106A057). The review considered the storage of the spent nuclear fuel in the spent fuel pool (SFP) and the onsite independent spent fuel storage installation, and the low likelihood of any credible accident resulting in radiological releases requiring offsite protective measures.

Based on the U.S. Nuclear Regulatory Commission (NRC) staff's initial review of PNPS's EP exemption request, the following request for additional information (RAI) is required to facilitate completion of the staff's technical review.

The enclosure to this email provides the RAI. On January 18, 2019, the draft RAI questions were sent to you to ensure that they were understandable, the regulatory bases for the questions were clear, and to determine if the information was previously docketed. On February 4, 2019, you stated that a clarifying teleconference was not needed and that Entergy would respond to the RAI within 30 days of the date of this email.

If you have any questions, please contact me at 301-415-3100 or via e-mail at John.Lamb@nrc.gov.

Sincerely,

John G. Lamb, Senior Project Manager
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure:
Request for Additional Information

RAI

REQUEST FOR ADDITIONAL INFORMATION
EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50.47
AND APPENDIX E TO 10 CFR PART 50
ENTERGY NUCLEAR OPERATIONS, INC.
PILGRIM NUCLEAR POWER STATION

Background

By letter dated July 3, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18186A635), Entergy Nuclear Operations, Inc. (Entergy) requested an exemption from specific emergency planning requirements of Title 10 of the Code of Federal Regulations (10 CFR) Part 50 for the Pilgrim Nuclear Power Station (PNPS), based on the proposed permanent cessation of power operations and removal of fuel from the reactor vessel, which is expected no later than June 1, 2019. The exemption request has been reviewed against the requirements in 10 CFR 50.47, "Emergency plans," and Appendix E to 10 CFR Part 50, "Emergency Planning and Preparedness for Production and Utilization Facilities," using the guidance provided in Interim Staff Guidance (ISG) NSIR/DPR-ISG-02, "Emergency Planning Exemption requests for Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML14106A057).

Applicable Regulation and Guidance

The current 10 CFR 50 regulatory requirements for emergency planning, developed for operating reactors, ensure protection of the health and safety of the public. However, once a power plant is permanently shutdown and defueled, some of these requirements exceed what is necessary to protect the health and safety of the public. Therefore, pursuant to 10 CFR 50.12 "Specific Exemptions", Entergy requested exemptions from certain emergency planning regulations in 10 CFR 50.47 and 10 CFR Part 50, Appendix E, for PNPS.

Guidance for the staff review of Emergency Plan Exemption Requests can be found in Interim Staff Guidance (ISG) NSIR/DPR-ISG-02, "Emergency Planning Exemption Requests for Decommissioning Nuclear Power Plants." This guidance notes that the provisions of 10 CFR 50.12 permit the NRC to grant exemptions from the requirements of 10 CFR Part 50 regulations in circumstances where the application of the regulation is not necessary to achieve the underlying purpose of the rule. The staff concluded that a minimum of 10 hours would provide adequate time to initiate mitigative actions to cool the fuel or, if needed, for offsite authorities to implement protective actions using a comprehensive emergency management plan (CEMP) approach. Thus, a formal offsite radiological emergency plan would not be necessary for permanently shutdown and defueled nuclear power reactor licensees when at least 10 hours would be necessary for the fuel to heat-up to the cladding ignition temperature following a complete loss of coolant.

Issue

By letter dated December 4, 2018 (ML18341A219), Entergy responded to a request for additional information related to heat transfer within the adiabatic analysis boundary. Specifically, considering the construction of the GNF2 fuel assembly, the staff requested a description of how the heat up rates of the upper and lower plenums would be the same as the rest of the fuel assembly, as was modeled in the Adiabatic Heatup Analysis for Drained Spent Fuel Pool provided by Entergy as Attachment 2 to the exemption request dated July 3, 2018.

The RAI response states:

The adiabatic heatup analysis is conservatively based on the limiting (lowest enrichment, highest burnup) GNF2 fuel assembly discharged from the last cycle at Pilgrim Nuclear Power Station.... The analysis defines an adiabatic envelope that incorporates the entire GNF2 fuel

assembly, including the metallic mass of the upper and lower plenum, as well as the partial mass of the GNF2 channel. GNF2 is a 10x10 array that utilizes the classical tie rod construction for structural support of the bundle. This design utilizes 8 tie rods to connect the upper and lower tie plates providing the structural support of the bundle. The fuel rods, including the 8 tie rods, are all in direct metal contact with the upper and lower plenums, which are in turn in direct metal contact with the channel and the water rods.... Direct metal contact provides a thermal pathway for the decay heat generated in the active region of the fuel rods to be conducted via the fuel cladding to these components. Under adiabatic conditions, there is no radiative, convective, or conductive heat transfer to the surrounding environment. Therefore, temperature differences between fuel assembly components are negligible and the components within the adiabatic envelope, including the upper and lower plenum regions, heat up at the same rate

The NRC staff found that the response does not justify an implicit assumption used in the analysis that all fuel components heat up uniformly because direct metal contact doesn't provide instantaneous heat transfer. While it is common to assume components within the adiabatic envelope are at the same temperature, this assumption must be justified or the envelope boundary should be moved to ensure the assumption is valid. The upper and lower plenums are complex components with much of their mass separated from the heat source (i.e., the fuel pellets) by metal with small cross-sectional area and by significant distance. Without rapid convective heat transfer and effective radiative heat transfer vertically, the bulk of the upper and lower plenum masses appear to have only weak thermal connectivity with the remainder of the fuel assembly. Therefore, the NRC staff does not agree that the direct metal contact described in the above response adequately justifies the conclusion of the response that all components within the adiabatic envelope, specifically the upper and lower plenums, heat up at the same rate.

The adiabatic analysis is meant to establish the minimum time for cladding to reach a temperature that could support runaway oxidation leading to extensive fuel damage. Therefore, heat sinks considered in the analysis must be shown to be thermally coupled with the cladding in the fuel region.

Request

The NRC staff requests the licensee to provide additional justification and/or description as to how the heat transfer could occur to all components within the proposed adiabatic envelope, specifically the upper and lower plenums, considering the complex design of the fuel assembly components, without significant delay in reaching 900 C within 10 hours.

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Mail Envelope Properties (John.Lamb@nrc.gov20190204164800)

Subject: RAI - Pilgrim EP Exemption (EPID: L-2018-LLE-0011)
Sent Date: 2/4/2019 4:48:29 PM
Received Date: 2/4/2019 4:48:00 PM
From: Lamb, John

Created By: John.Lamb@nrc.gov

Recipients:

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Tracking Status: None
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Post Office:

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MESSAGE	8568	2/4/2019 4:48:00 PM

Options

Priority: High
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