



## **NUCLEAR REGULATORY COMMISSION**

**[Docket Nos. 50-272 and 50-311; NRC-2025-0068]**

**PSEG Nuclear LLC; Constellation Energy Generation, LLC; Salem Nuclear  
Generating Station, Unit Nos. 1 and 2; Exemption**

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Notice; issuance.

**SUMMARY:** The U.S. Nuclear Regulatory Commission (NRC) has issued an exemption from certain emergency core cooling system requirements to support the use of Optimized ZIRLO™ fuel rod cladding material at Salem Nuclear Generating Station, Unit Nos. 1 and 2. The exemption was issued in response to a July 24, 2024, request from PSEG Nuclear LLC (PSEG).

**DATES:** The exemption was issued on April 24, 2025.

**ADDRESSES:** Please refer to Docket ID NRC-2025-0068 when contacting the NRC about the availability of information regarding this document. You may obtain publicly available information related to this document using any of the following methods:

- *Federal Rulemaking Website:* Go to <https://www.regulations.gov> and search for Docket ID NRC-2025-0068. Address questions about Docket IDs in Regulations.gov to Bridget Curran; telephone: 301-415-1003; email: [Bridget.Curran@nrc.gov](mailto:Bridget.Curran@nrc.gov). For technical questions, contact the individual listed in the “For Further Information Contact” section of this document.

- *NRC’s Agencywide Documents Access and Management System (ADAMS):* You may obtain publicly available documents online in the ADAMS Public Documents collection at <https://www.nrc.gov/reading-rm/adams.html>. To begin the search, select “Begin Web-based ADAMS Search.” For problems with ADAMS, please contact the NRC’s Public Document Room (PDR) reference staff at 1-800-397-4209, at 301-415-4737, or by email to [PDR.Resource@nrc.gov](mailto:PDR.Resource@nrc.gov). The PSEG request for an exemption is

available in ADAMS under Accession No. ML24206A100. The NRC staff's letter issuing the exemption is available in ADAMS under Accession No. ML25078A006.

- *NRC's PDR*: The PDR, where you may examine and order copies of publicly available documents, is open by appointment. To make an appointment to visit the PDR, please send an email to [PDR.Resource@nrc.gov](mailto:PDR.Resource@nrc.gov) or call 1-800-397-4209 or 301-415-4737, between 8 a.m. and 4 p.m. eastern time (ET), Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Blake A. Purnell, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-1380; email: [Blake.Purnell@nrc.gov](mailto:Blake.Purnell@nrc.gov).

**SUPPLEMENTARY INFORMATION:** The text of the exemption is attached.

Dated: April 30, 2025.

For the Nuclear Regulatory Commission.

**Blake Purnell,**  
*Senior Project Manager,  
Plant Licensing Branch II-2,  
Division of Operating Reactor Licensing,  
Office of Nuclear Reactor Regulation.*

**Attachment – Exemption.**

**NUCLEAR REGULATORY COMMISSION**

**Docket Nos. 50-272 and 50-311**

**PSEG Nuclear LLC**

**Constellation Energy Generation, LLC**

**Salem Nuclear Generating Station, Unit Nos. 1 and 2**

**Exemption**

**I. Background.**

PSEG Nuclear LLC (PSEG) and Constellation Energy Generation, LLC are the holders of Renewed Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Nuclear Generating Station (Salem), Unit Nos. 1 and 2. The Salem facilities consist of two pressurized-water reactors located in Salem County, New Jersey. The licenses provide, among other things, that the facilities are subject to all rules, regulations, and orders of the Nuclear Regulatory Commission (NRC or Commission) now or hereafter in effect.

**II. Request/Action.**

By letter dated July 24, 2024 (Agencywide Documents Access and Management System Accession No. ML24206A100), PSEG requested an exemption from certain emergency core cooling system (ECCS) requirements in title 10 of the *Code of Federal Regulations* (10 CFR) part 50 applicable to Salem, Unit Nos. 1 and 2. PSEG requested the exemption in accordance with 10 CFR 50.12, “Specific exemptions,” to support the use of Optimized ZIRLO™ fuel rod cladding material in Salem, Unit Nos. 1 and 2.

The regulations in 10 CFR 50.46, “Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors,” require, in part, that each boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical Zircaloy or ZIRLO® cladding must be provided with an ECCS that must be designed so that its calculated cooling performance following postulated loss-of-coolant

accidents (LOCAs) conforms to the criteria set forth in 10 CFR 50.46(b). In addition, paragraph I.A.5, "Metal—Water Reaction Rate," of 10 CFR part 50, appendix K, requires the Baker-Just equation be used to calculate the rate of energy release, hydrogen generation, and cladding oxidation from the metal-water reaction in the core. The regulations in 10 CFR 50.46 and the Baker-Just equation in 10 CFR part 50, Appendix K, part I, presume the use of either Zircaloy or ZIRLO<sup>®</sup> fuel rod cladding.

In accordance with 10 CFR 50.12, "Specific exemptions," PSEG requested an exemption from 10 CFR 50.46 and 10 CFR part 50, appendix K, paragraph I.A.5, to support the use of Optimized ZIRLO<sup>™</sup> fuel rod cladding material in Salem, Unit Nos. 1 and 2. The requested exemption is limited to the cladding material such that all other requirements in 10 CFR 50.46 and 10 CFR part 50, appendix K, will remain applicable to Salem, Unit Nos. 1 and 2.

PSEG's July 24, 2024, letter also included a license amendment request to permit the use of Optimized ZIRLO<sup>™</sup> fuel rod cladding in Salem, Unit Nos. 1 and 2. The requested exemption is a prerequisite for the issuance of the amendments. The NRC staff's review of the license amendment request is being performed concurrently with the exemption request. The NRC staff's safety evaluation for the license amendment request will be documented separately.

### **III. Discussion.**

Pursuant to 10 CFR 50.12, the Commission may grant exemptions from the requirements of 10 CFR part 50 provided that: (1) the exemptions are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security; and (2) special circumstances, as defined in 10 CFR 50.12(a)(2), are present. The requested exemption to support the use of fuel rods with Optimized ZIRLO<sup>™</sup> cladding at Salem, Unit Nos. 1 and 2, meets these requirements as discussed below.

**A. The Exemption is Authorized by Law.**

The requested exemption would allow the use of Optimized ZIRLO™ fuel rod cladding at Salem, Unit Nos. 1 and 2. No statute precludes the use of Optimized ZIRLO™ fuel rod cladding in nuclear reactors, and no statute required the Commission to issue its regulations in 10 CFR 50.46 and 10 CFR part 50, appendix K. Granting the exemption will not result in a violation of the Atomic Energy Act of 1954, as amended or the NRC's regulations. Therefore, the exemption is authorized by law.

**B. The Exemption Presents no Undue Risk to Public Health and Safety.**

The regulations in 10 CFR 50.46 establish acceptance criteria for ECCS performance for reactors during a LOCA that provide for the adequate protection of public health and safety. The regulations in 10 CFR part 50, appendix K, part I, specify the required and acceptable features of ECCS evaluation models that may be used to demonstrate compliance with the acceptance criteria in 10 CFR 50.46. The regulations in 10 CFR 50.46 and the Baker-Just equation in 10 CFR part 50, Appendix K, part I, presume the use of either Zircaloy or ZIRLO® fuel rod cladding.

The technical basis for Optimized ZIRLO™ is described in the Westinghouse topical report WCAP-12610-P-A & CENPD-404-P-A, addendum 1-A, "Optimized ZIRLO™," dated July 2006 (Westinghouse addendum 1-A). The transmittal letter and non-proprietary version of Westinghouse addendum 1-A are available under ADAMS Accession Nos. ML062080563 and ML062080569, respectively. By letter dated June 10, 2005, the NRC staff found that this topical report is acceptable for referencing in licensing applications to the extent specified and under the conditions and limitations delineated in the topical report and associated staff safety evaluation. The NRC staff's letter and safety evaluation with the conditions on the approval of the topical report are included in Westinghouse Addendum 1-A.

The Westinghouse addendum 1-A demonstrated that the effectiveness of the ECCS will not be affected by using fuel rods with Optimized ZIRLO™ cladding. Additionally, the NRC staff's safety evaluation for Westinghouse Addendum 1-A

concluded, in part, that the ECCS performance criteria in 10 CFR 50.46 and the Baker-Just correlation in 10 CFR part 50, appendix K, part I, are applicable to Optimized ZIRLO™.

The PSEG request for an exemption is limited to the cladding material such that all other requirements in 10 CFR 50.46 and 10 CFR part 50, appendix K, will remain applicable to Salem, Unit Nos. 1 and 2. The requested exemption is solely to allow the use of criteria and methods set forth in these regulations for fuel rods with Optimized ZIRLO™ cladding. The reactor core reload design process at Salem, Unit Nos. 1 and 2, will continue to ensure that the acceptance criteria in 10 CFR 50.46 are met using ECCS evaluations models that are acceptable to the NRC. Therefore, the granting of this exemption request will not pose an undue risk to public health and safety.

**C. The Exemption is Consistent with the Common Defense and Security.**

The requested exemption would allow PSEG to use fuel rods with Optimized ZIRLO™ cladding in Salem, Unit Nos. 1 and 2. This change in cladding material will not result in any changes to plant operations that would impact the security of the facility, special nuclear material, or spent nuclear fuel. Therefore, the NRC staff has determined that the requested exemption is consistent with the common defense and security.

**D. Special Circumstances.**

Special circumstances, in accordance with 10 CFR 50.12(a)(2)(ii), are present whenever application of the regulation in the circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. The underlying purpose of 10 CFR 50.46 is to provide requirements capable of ensuring adequate core cooling during and after the most limiting postulated LOCA. The underlying purpose of 10 CFR part 50, appendix K, part I, is to specify the required and acceptable features of ECCS evaluation models that may be used to demonstrate compliance with the acceptance criteria in 10 CFR 50.46.

The regulations in 10 CFR 50.46 and the Baker-Just equation in 10 CFR part 50, Appendix K, part I, presume the use of either Zircaloy or ZIRLO® fuel rod cladding. The

PSEG request for an exemption is limited to the cladding material such that all other requirements in 10 CFR 50.46 and 10 CFR part 50, appendix K, will remain applicable to Salem, Unit Nos. 1 and 2. The requested exemption is solely to allow the use of criteria and methods set forth in these regulations for fuel rods with Optimized ZIRLO™ cladding. The reactor core reload design process at Salem, Unit Nos. 1 and 2, will continue to ensure that the acceptance criteria in 10 CFR 50.46 are met using ECCS evaluations models that are acceptable to the NRC. Therefore, the underlying purpose of the regulations in 10 CFR 50.46 and 10 CFR part 50, appendix K, part I, would continue to be achieved with the exemption, and the special circumstances in 10 CFR 50.12(a)(ii) for the granting of an exemption exist.

#### **IV. Environmental Considerations.**

The exemption changes a requirement with respect to installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. With respect to its impact on the quality of the human environment, the NRC has determined, as described below, that the issuance of the exemption meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). The regulation in 10 CFR 51.22(c)(9) states:

Issuance of an amendment to a permit or license for a reactor under part 50 or part 52 of this chapter that changes a requirement or issuance of an exemption from a requirement, with respect to installation or use of a facility component located within the restricted area, as defined in part 20 of this chapter; or the issuance of an amendment to a permit or license for a reactor under part 50 or part 52 of this chapter that changes an inspection or a surveillance requirement; provided that: (i) The amendment or exemption involves no significant hazards consideration; (ii) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite; and (iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The criteria for determining whether an action involves a significant hazards consideration are found in 10 CFR 50.92, "Issuance of amendment." The proposed action is to permit the use of Optimized ZIRLO™ fuel rod cladding in Salem, Unit Nos. 1 and 2. The exemption is a prerequisite for the NRC staff to issue license amendments for the Salem units, which will complete the proposed action. The NRC staff's review of

the exemption and license amendment requests are being performed concurrently. The Commission has previously issued a proposed finding that the associated license amendments involve no significant hazards consideration, and there has been no public comment on such finding (89 FR 79971; October 1, 2024). Therefore, the NRC staff has determined that the proposed action involves no significant hazards consideration. The NRC staff has also determined that the proposed action involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure because Optimized ZIRLO™ has similar properties and performance characteristics as the currently licensed cladding.

Based on the above, the NRC staff concludes that the proposed exemption meets the eligibility criteria for the categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the exemption.

## **V. Conclusions.**

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12, the exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. Also, special circumstances are present. Therefore, the Commission hereby grants PSEG an exemption from 10 CFR 50.46 and 10 CFR part 50, appendix K, paragraph I.A.5, to support the use of Optimized ZIRLO™ fuel rod cladding material in Salem, Unit Nos. 1 and 2. This exemption relates solely to the limitations on cladding material in these regulations.

Dated at Rockville, Maryland, this 24<sup>th</sup> day of April 2025.

For the Nuclear Regulatory Commission.

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Aida Rivera-Varona, Deputy Director,  
Division of Operating Reactor Licensing,  
Office of Nuclear Reactor Regulation.

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