[7590-01-P]

NUCLEAR REGULATORY COMMISSION

[Docket No. 50-244; NRC-2017-0124]

Exelon Generation Company, LLC; R. E. Ginna Nuclear Power Plant;

Use of Optimized ZIRLO™ Fuel Rod Cladding

AGENCY: Nuclear Regulatory Commission.

ACTION: Exemption; issuance.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is issuing an exemption in response to an August 22, 2016, request from Exelon Generation Company, LLC (Exelon) in order to use Optimized ZIRLO™ Fuel Rod Cladding at the R. E. Ginna Nuclear Power Plant (Ginna).

DATES: The exemption was issued on June 19, 2017.

ADDRESSES: Please refer to Docket ID **NRC-2017-0124** 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 Web Site:** Go to http://www.regulations.gov and search for Docket ID **NRC-2017-0124**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@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 http://www.nrc.gov/reading-rm/adams.html. To begin the search, select "ADAMS Public Documents" and then 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,

301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: V. Sreenivas, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001; telephone: 301-415-2597, e-mail: V.Sreenivas@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Background

Exelon Generation Company, LLC is the holder of Renewed Facility Operating License No. DPR-18, which authorizes operation of Ginna, a pressurized-water reactor. The license provides, among other things, that the facility is subject to all rules, regulations, and orders of the NRC now or hereafter in effect. The facility is located in Ontario, New York, approximately 20 miles northeast of Rochester, New York.

II. Request/Action

Pursuant to § 50.12 of title 10 of the *Code of Federal Regulations* (10 CFR), "Specific exemptions," the licensee requested, by letter dated August 22, 2016 (ADAMS Accession No. ML16236A300), an exemption from § 50.46, "Acceptance criteria for emergency core

cooling systems [ECCS] for light-water nuclear power reactors," and 10 CFR part 50, appendix K, "ECCS Evaluation Models," to allow the use of Optimized ZIRLO ™ fuel rod cladding. The regulations in § 50.46 contain acceptance criteria for the ECCS for reactors fueled with zircaloy or ZIRLO™ fuel rod cladding material. In addition, 10 CFR part 50, appendix K, requires that the Baker-Just equation be used to predict the rates of energy release, hydrogen concentration, and cladding oxidation from the metal/water reaction. The Baker-Just equation assumes the use of a zirconium alloy different than Optimized ZIRLO™ material. Therefore, an exemption to § 50.46 and 10 CFR part 50, appendix K is required to support the use of Optimized ZIRLO™ fuel rod cladding at Ginna.

The exemption request relates solely to the specific types of cladding material specified in these regulations (i.e., fuel rods with Zircaloy or ZIRLO® cladding). This request will provide for the application of the acceptance criteria of § 50.46 and appendix K to 10 CFR part 50 to fuel assembly designs utilizing Optimized ZIRLO™ fuel rod cladding. The NRC staff prepared a separate safety evaluation fully addressing Exelon's application for a related license amendment.

III. Discussion

Pursuant to § 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR part 50 when: 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) when special circumstances are present. Under § 50.12(a)(2), special circumstances include, among other things, when

application of the specific regulation in the particular circumstance would not serve, or is not necessary to achieve, the underlying purpose of the rule.

A. Authorized by Law

The exemption would allow the use of Optimized ZIRLO™ fuel rod cladding material at Ginna. As stated above, § 50.12 allows the NRC to grant exemptions from the requirements of 10 CFR part 50. The NRC staff has determined that granting the licensee's requested exemption would not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations. Therefore, the exemption is authorized by law.

B. No Undue Risk to Public Health and Safety

The underlying purpose of § 50.46 is to establish acceptance criteria for adequate ECCS performance. By letter dated June 10, 2005, the NRC staff issued a safety evaluation (ADAMS Accession No ML051670408) approving Addendum 1 to Westinghouse Topical Report WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO™" (these topical reports are not publicly available because they contain proprietary information), wherein the NRC staff approved the use of Optimized ZIRLO™ as a fuel cladding material. The NRC staff approved the use of Optimized ZIRLO™ as a fuel cladding material based on: 1) similarities with standard ZIRLO™, 2) demonstrated material performance, and 3) a commitment to provide irradiated data and validate fuel performance models ahead of burnups achieved in batch application. The NRC staff's safety evaluation for Optimized ZIRLO™ includes ten conditions and limitations for its use. As previously documented in the NRC staff's review of topical reports submitted by Westinghouse Electric Company, LLC (Westinghouse), and subject to compliance with the specific conditions of approval established therein, the NRC staff finds that the applicability of

these ECCS acceptance criteria to Optimized ZIRLO™ has been demonstrated by Westinghouse. Ring compression tests performed by Westinghouse on Optimized ZIRLO™ (NRC-reviewed, approved, and documented in Appendix B of WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™") demonstrate an acceptable retention of post-quench ductility up to § 50.46 limits of 2,200 degrees Fahrenheit and 17 percent equivalent clad reacted. Furthermore, the NRC staff has concluded that oxidation measurements provided by the licensee illustrate that oxide thickness (and associated hydrogen pickup) for Optimized ZIRLO™ at any given burnup would be less than both zircaloy-4 and ZIRLO™. Hence, the NRC staff concludes that Optimized ZIRLO™ would be expected to maintain better post-quench ductility than ZIRLO™. This finding is further supported by an ongoing loss-of-coolant accident research program at Argonne National Laboratory, which has identified a strong correlation between cladding hydrogen content (due to in-service corrosion) and post-quench ductility.

The underlying purpose of 10 CFR part 50, appendix K, section I.A.5, "Metal-Water Reaction Rate," is to ensure that cladding oxidation and hydrogen generation are appropriately limited during a loss-of-coolant accident and conservatively accounted for in the ECCS evaluation model. Appendix K states that the rates of energy release, hydrogen concentration, and cladding oxidation from the metal-water reaction shall be calculated using the Baker-Just equation. Since the Baker-Just equation presumes the use of zircaloy clad fuel, strict application of the rule would not permit use of the equation for Optimized ZIRLO™ cladding for determining acceptable fuel performance. However, the NRC staff has found that metal-water reaction tests performed by Westinghouse on Optimized ZIRLO™ demonstrate conservative reaction rates relative to the Baker-Just equation and are bounding for those approved for ZIRLO™ under anticipated operational occurrences and postulated accidents.

Based on the above, no new accident precursors are created by using Optimized ZIRLO™; thus, the probability of postulated accidents is not increased. Also, based on the above, the consequences of postulated accidents are not increased. Therefore, there is no undue risk to public health and safety due to using Optimized ZIRLO™.

C. Consistent with the Common Defense and Security

The proposed exemption would allow the use of Optimized ZIRLO™ fuel rod cladding material at Ginna. This change to the plant configuration has no relation to security issues. Therefore, the common defense and security is not impacted by this exemption.

D. Special Circumstances

Special circumstances, in accordance with § 50.12(a)(2)(ii), are present whenever application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. The underlying purpose of § 50.46 and appendix K to 10 CFR part 50 is to establish acceptance criteria for ECCS performance. The wording of the regulations in § 50.46 and appendix K is not directly applicable to Optimized ZIRLO™, even though the evaluations above show that the intent of the regulation is met. Therefore, since the underlying purposes of § 50.46 and appendix K are achieved through the use of Optimized ZIRLO™ fuel rod cladding material, the special circumstances required by § 50.12(a)(2)(ii) for the granting of an exemption from certain requirements of § 50.46 and appendix K exist.

E. Environmental Considerations

The NRC staff determined that the exemption discussed herein meets the eligibility criteria for the categorical exclusion set forth in § 51.22(c)(9) because it is related to a

requirement concerning the installation or use of a facility component located within the restricted area, as defined in 10 CFR part 20, and the granting of this exemption involves: 1) no significant hazards consideration, 2) no significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, and 3) no significant increase in individual or cumulative occupational radiation exposure. Therefore, in accordance with § 51.22(b), no environmental impact statement or environmental assessment need to be prepared in connection with the NRC's consideration of this exemption request. The basis for the NRC staff's determination is discussed as follows with an evaluation against each of the requirements in § 51.22(c)(9).

Requirements in § 51.22(c)(9)(i)

The NRC staff evaluated the issue of no significant hazards consideration, using the standards described in § 50.92(c), as presented below:

1. Does the proposed exemption involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed change would allow the use of Optimized ZIRLO™ clad nuclear fuel in the reactors. The NRC-approved topical report WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," prepared by Westinghouse Electric Company, LLC (Westinghouse), addresses Optimized ZIRLO™ and demonstrates that Optimized ZIRLO™ has essentially the same properties as currently licensed ZIRLO®. The fuel cladding itself is not an accident initiator and does not affect accident probability.

2. Does the proposed exemption create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

Use of Optimized ZIRLO™ clad fuel will not result in changes in the operation or configuration of the facility. Topical Report WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, demonstrated that the material properties of Optimized ZIRLO™ are similar to those of standard ZIRLO®, thus precluding the possibility of the fuel cladding becoming an accident initiator and causing a new or different type of accident. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed exemption involve a significant reduction in a margin of safety?

Response: No.

The proposed change will not involve a significant reduction in the margin of safety. Topical Report WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, demonstrated that the material properties of the Optimized ZIRLO™ are not significantly different from those of standard ZIRLO®. Optimized ZIRLO™ is expected to perform similarly to standard ZIRLO® for all normal operating and accident scenarios, including both loss of coolant accident LOCA) and non-LOCA scenarios. For LOCA scenarios, where the slight difference is Optimized ZIRLO™ material properties relative to standard ZIRLO® could have some impact on the overall accident scenario, plant-specific LOCA analyses using Optimized ZIRLO™ properties will demonstrate that the acceptance criteria of 10 CFR 50.46 have been satisfied. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, the NRC staff concludes that the proposed exemption presents no significant hazards consideration under the standards set forth in § 50.92(c), and, accordingly, a finding of no significant hazards consideration is justified (i.e., satisfies the provisions of § 51.22(c)(9)(i)).

Requirements in § 51.22(c)(9)(ii)

The proposed exemption would allow the use of Optimized ZIRLO™ fuel rod cladding material at Ginna. Optimized ZIRLO™ has essentially the same properties are currently licensed ZIRLO®. The use of Optimized ZIRLO™ fuel rod cladding material will not significantly change the types of effluents that may be released offsite or significantly increase the amount of effluents that may be released offsite. Therefore, the provisions of § 51.22(c)(9)(ii) are satisfied.

Requirements in § 51.22(c)(9)(iii)

The proposed exemption would allow the use of Optimized ZIRLO™ fuel rod cladding material at Ginna. Optimized ZIRLO™ has essentially the same properties are currently licensed ZIRLO®. The use of Optimized ZIRLO™ fuel rod cladding material at Ginna will not significantly increase individual occupational radiation exposure or significantly increase cumulative occupational radiation exposure. Therefore, the provisions of § 51.22(c)(9)(iii) are satisfied.

Conclusion

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

IV. Conclusion

Accordingly, the Commission has determined that, pursuant to § 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 Exelon an exemption from certain requirements of § 50.46 and 10 CFR part 50, appendix K, to allow the use of Optimized ZIRLO™ fuel rod cladding material at Ginna.

Dated at Rockville, Maryland, this 19th day of June 2017.

For the Nuclear Regulatory Commission.

MaryJane Ross-Lee, Acting Director,
Division of Operating Reactor Licensing,
Office of Nuclear Reactor Regulation.

[FR Doc. 2017-13517 Filed: 6/27/2017 8:45 am; Publication Date: 6/28/2017]