[7590-01-P]

NUCLEAR REGULATORY COMMISSION

[Docket No. 50-289; NRC-2013-0274]

Exelon Generation Company, LLC

Three Mile Island Nuclear Station, Unit 1

AGENCY: Nuclear Regulatory Commission.

ACTION: Exemption.

SUMMARY: Exelon Generation Company, LLC (Exelon, the licensee) is the holder of Renewed Facility Operating License No. DPR-50, which authorizes operation of the Three Mile Island Nuclear Station, Unit 1 (TMI-1). The license provides, among other things, that the facility is subject to all rules, regulations, and orders of the Nuclear Regulatory Commission (NRC) now or hereafter in effect.

ADDRESSES: Please refer to Docket ID **NRC-2013-0274** when contacting the NRC about the availability of information regarding this document. You may access publicly-available information related to this action by the following methods:

- **Federal Rulemaking Web site:** Go to http://www.regulations.gov and search for Docket ID **NRC-2013-0274**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may access publicly available documents online in the NRC Library 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 in this document (if that document is available in ADAMS) is provided the first time that a document is referenced.

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SUPPLEMENTARY INFORMATION

1.0 BACKGROUND

Exelon Generation Company, LLC (Exelon, the licensee) is the holder of Renewed Facility Operating License No. DPR-50, which authorizes operation of the Three Mile Island Nuclear Station, Unit 1 (TMI-1). 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 consists of a single pressurized-water reactor located in Dauphin County, Pennsylvania.

2.0 REQUEST/ACTION

Part 50, Appendix G of Title 10 of the *Code of Federal Regulations* (10 CFR), "Fracture Toughness Requirements," specifies fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary of light water nuclear power reactors to provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests, to which the pressure boundary may be subjected over its service lifetime. Section 50.61, "Fracture toughness requirements for protection against pressurized thermal shock [PTS] events," provides fracture toughness requirements for protection against PTS events. By letter dated

December 14, 2012, (ADAMS) Accession No. ML12353A319), as supplemented by letters dated January 31, 2013, and August 13, 2013, (ADAMS Accession Nos. ML13032A312 and ML13232A214, respectively), Exelon proposed exemptions from portions of the requirements of 10 CFR Part 50, Appendix G and 10 CFR 50.61, to revise certain TMI-1 reactor pressure vessel (RPV) initial (unirradiated) properties using AREVA Non-Proprietary Topical Report (TR) BAW-2308, Revisions 1A and 2A, “Initial RT_{NDT} [nil-ductility reference temperature] of Linde 80 Weld Materials.”

The licensee requested an exemption from portions of 10 CFR Part 50, Appendix G, to replace the required use of the existing Charpy V-notch (C_v) and drop weight-based methodology and allow the use of an alternate methodology to incorporate the use of fracture toughness test data for evaluating the integrity of the TMI-1 Linde 80 weld materials in the RPV beltline. This request for exemption is based on the use of the 1997 and 2002, editions of American Society for Testing and Materials (ASTM) Standard Test Method E 1921 (ASTM E 1921), “Standard Test Method for Determination of Reference Temperature T_0, for Ferritic Steels in the Transition Range,” and American Society for Mechanical Engineering (ASME), *Boiler and Pressure Vessel Code* (Code), Code Case N-629, “Use of Fracture Toughness Test Data to Establish Reference Temperature for Pressure Retaining Materials, Section III, Division 1, Class 1.” Specifically, 10 CFR Part 50, Appendix G(II)(D)(i), requires that the nil-ductility reference temperature (RT_{NDT}) be evaluated according to the procedures in the ASME Code, Section III, Division 1, “Rules for Construction of Nuclear Power Plant Components,” Paragraph NB-2331, “Material for Vessels.” These procedures require the use of a methodology based on drop weight tests (NB-2331(a)(1)) and C_v test data (NB-2331(a)(2)). In addition, 10 CFR Part 50, Appendix G,(I)(A) requires the use of methods equivalent to Appendix G to ASME Section XI, Division 1, “Rules for Inservice Inspection of Nuclear Power

Plant Components," which specifies the use of values that have been determined using C_v and drop weight tests described above. Therefore, an exemption from portions of 10 CFR Part 50, Appendix G, is required.

The licensee also requested an exemption from portions of 10 CFR 50.61 to use an alternate methodology to allow the use of fracture toughness test data for evaluating the integrity of the TMI-1 RPV Linde 80 beltline welds based on the use of the 1997 and 2002, editions of ASTM E 1921 and ASME Code Case N-629. Similar to the above, 10 CFR 50.61(a)(5) requires that the initial (unirradiated) RT_{NDT}, be evaluated according to the procedures in the ASME Code, Section III, Division 1, Paragraph NB-2331. As stated previously, these procedures require the use of a methodology based on drop weight tests (NB-2331(a)(1)) and C_v test data (NB-2331(a)(2)). Therefore, the exemption is required since the methodology for evaluating RPV material fracture toughness in 10 CFR 50.61 requires the use of the C_v and drop weight data to determine the initial RT_{NDT} for establishing the PTS reference temperature (RT_{PTS}).

3.0 DISCUSSION

Pursuant to 10 CFR 50.12(a), 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) special circumstances are present. The special circumstance that applies to these exemptions is consistent with 10 CFR 50.12(a)(2)(ii) in that the application of the regulations in this circumstance is not necessary to achieve the underlying purpose of the rules. This special circumstance allows the licensee an exemption from the use of the C_v and drop weight-based methodology required by 10 CFR Part 50, Appendix G and 10 CFR 50.61. These exemptions only modify the methodology to be used by the licensee for demonstrating compliance with the requirements of 10 CFR Part 50, Appendix G and 10 CFR 50.61, and do not exempt the licensee from meeting any other requirement of 10 CFR Part 50, Appendix G and 10 CFR 50.61.

Authorized by Law

These exemptions would allow the licensee to use an alternate methodology to make use of fracture toughness test data for evaluating the integrity of the TMI-1 RPV Linde 80 beltline materials, and would not result in changes to operation of the plant. Section 50.60(b) allows the use of proposed alternatives to the described requirements in 10 CFR Part 50, Appendix G, or portions thereof, when an exemption is granted by the Commission under 10 CFR 50.12. As stated above, 10 CFR 50.12(a) allows the NRC to grant exemptions from portions of the requirements of 10 CFR Part 50, Appendix G and 10 CFR 50.61. The NRC staff has determined that granting of the licensee's proposed exemptions will not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations. Therefore, the exemptions are authorized by law.

No Undue Risk to Public Health and Safety

The underlying purpose of Appendix G to 10 CFR Part 50 is to set forth fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary of light water nuclear power reactors to provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests, to which the pressure boundary may be subjected over its service lifetime. The methodology underlying the requirements of Appendix G to 10 CFR Part 50 is based on the use of C_v and drop weight data because of reference to the ASME Code, as previously described. The licensee proposes to replace the use of the existing C_v and drop weight-based methodology by a fracture toughness-based methodology to demonstrate compliance with Appendix G to 10 CFR Part 50.

The NRC staff has concluded that the requested exemption to Appendix G to 10 CFR Part 50 is justified based on the licensee utilizing the fracture toughness methodology specified in TR BAW-2308, Revisions 1A and 2A, within the conditions and limitations delineated in the NRC staff's safety evaluations (SEs), dated August 4, 2005, and March 24, 2008 (ADAMS Accession Nos. ML052070408 and ML080770349, respectively). The use of the methodology specified in the NRC staff's SEs will ensure that pressure-temperature limits developed for the TMI-1 RPV will continue to be based on an adequately conservative estimate of RPV material properties and ensure that the pressure-retaining components of the reactor coolant pressure boundary retain adequate margins of safety during any condition of normal operation, including anticipated operational occurrences. This exemption only modifies the methodology to be used by the licensee for demonstrating compliance with the requirements of 10 CFR Part 50, Appendix G(II)(D)(i) and 10 CFR Part 50, Appendix G(I)(A), and does not exempt the licensee from meeting any other requirement of Appendix G to 10 CFR Part 50.

Based on the above information, no new accident precursors are created by allowing an exemption from the use of the existing C_v and drop weight-based methodology and the use of an alternative fracture toughness-based methodology to demonstrate compliance with Appendix G to 10 CFR Part 50; thus, the probability of postulated accidents is not increased. Also, based on the above information, the consequences of postulated accidents are not increased. Therefore, there is no undue risk to public health and safety associated with the proposed exemption to Appendix G to 10 CFR Part 50.

The underlying purpose of 10 CFR 50.61 is to establish requirements for evaluating the fracture toughness of RPV materials to ensure that a licensee's RPV will be protected from failure during a PTS event. The licensee seeks an exemption from portions of 10 CFR 50.61 to use a methodology for the determination of adjusted/indexing reference temperatures. The licensee proposes to use ASME Code Case N-629 and the methodology outlined in its submittal, which are based on the use of fracture toughness data, as an alternative to the C_v and drop weight-based methodology required by 10 CFR 50.61 for establishing the initial, unirradiated properties when calculating RT_{PTS} values. The NRC staff has concluded that the exemption is justified based on the licensee utilizing the methodology specified in the NRC staff's SEs regarding TR BAW-2308, Revisions 1A and 2A, dated August 4, 2005, and March 24, 2008, respectively. This TR established an alternative method for determining initial (unirradiated) material reference temperatures for RPV welds manufactured using Linde 80 weld flux (i.e., "Linde 80 welds") and established weld wire heat-specific and Linde 80 weld generic values of this reference temperature. These weld wire heat-specific and Linde 80 weld generic values may be used in lieu of the RT_{NDT} parameter, the determination of which is specified by paragraph NB-2331 of Section III of the ASME Code. Regulations associated with the determination of RPV material properties involving protection of the RPV from brittle failure or ductile rupture include Appendix G to 10 CFR Part 50 and 10 CFR 50.61, the PTS rule. These regulations require that the initial (unirradiated) material reference temperature, RT_{NDT}, be determined in accordance with the provisions of the ASME Code, and provide the process for determination of RT_{PTS}, the reference temperature RT_{NDT}, evaluated for the end of license neutron fluence.

In TR BAW-2308, Revision 1, the Babcock and Wilcox Owners Group proposed to perform fracture toughness testing based on the application of the Master Curve evaluation procedure, which permits data obtained from sample sets tested at different temperatures to be combined, as the basis for redefining the initial (unirradiated) material properties of Linde 80 welds. The NRC staff evaluated this methodology for determining Linde 80 weld initial (unirradiated) material properties and uncertainty in those properties, as well as the overall method for combining unirradiated material property measurements based on T_0 (initial temperature) values (i.e., initial, unirradiated nil-ductility reference temperature (IRT_{T_0})), with property shifts from models in Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," which are based on C_v testing and a defined margin term to account for uncertainties in the NRC staff SE. Table 3 in the staff's SE of BAW-2308, Revision 1, dated August 4, 2005, contains the NRC staff-accepted IRT_{T_0} and initial margin (denoted as σ_i) for specific Linde 80 weld wire heat numbers.

In accordance with the limitations and conditions outlined in the NRC staff's SE of TR BAW-2308, Revision 1, dated August 4, 2005, for utilizing the values in Table 3: (1) the licensee has utilized the appropriate NRC staff-accepted IRT_{T_0} and σ_i values for applicable Linde 80 weld wire heat numbers; (2) applied chemistry factors greater than 167°F (the weld wire heat-specific chemical composition, via the methodology of RG 1.99, Revision 2, indicated that chemistry factors higher than 167°F are applicable); (3) applied a value of 28°F for σ_Δ (i.e, shift margin) in the margin term; and (4) submitted values for ΔRT_{NDT} and the margin term for each Linde 80 weld in the RPV through the end of the current operating license. Additionally, the NRC's SE for TR BAW-2308, Revision 2, concludes that the revised IRT_{T_0} and σ_i values for Linde 80 weld materials are acceptable for referencing in plant-specific licensing applications as delineated in TR BAW-2308, Revision 2, and to the extent specified under Section 4.0, "Limitations and Conditions," of the SE, which states: "Future plant-specific applications for RPVs containing weld wire heat 72105, and weld wire heat 299L44, of Linde 80 welds must use the revised IRT_{T_0} and σ_i, values in TR BAW-2308, Revision 2." The TMI-1 RPV beltline lower nozzle belt to upper shell circumferential weld contains weld heat 72105. The following TMI-1 RPV beltline welds contain weld heat 299L44: lower shell longitudinal weld (inner diameter 37 percent), and upper shell to lower shell circumferential weld. The licensee used the staff-accepted IRT_{T_0} and σ_i values for Linde 80 weld materials containing weld wire heats 299L44 and 72105. The NRC staff concludes that all conditions and limitations outlined in the NRC staff SEs for TR BAW-2308, Revisions 1A and 2A, have been met for TMI-1.

The use of the methodology in TR BAW-2308, Revisions 1A and 2A, will ensure the PTS evaluation developed for the TMI-1 RPV will continue to be based on an adequately conservative estimate of RPV material properties and ensure the RPV will be protected from failure during a PTS event. The NRC staff's SEs dated August 4, 2005, and March 24, 2008, stipulate that licensees utilize the fracture toughness methodology, specified in TR BAW-2308, Revisions 1A and 2A, within the conditions and limitations delineated in the SEs.

Based on the above information, no new accident precursors are created by allowing an exemption to use an alternate methodology to comply with the requirements of 10 CFR 50.61 in determining adjusted/indexing reference temperatures; thus, the probability of postulated accidents is not increased. Also, based on the above information, the consequences of postulated accidents are not increased. Therefore, there is no undue risk to public health and safety.

<u>Consistent with Common Defense and Security</u>

The he proposed exemptions would allow the licensee to use alternate methodologies from those specified in 10 CFR Part 50, Appendix G, and 10 CFR 50.61, to allow the use of fracture toughness test data for evaluating the integrity of the TMI-1 RPV beltline welds. This change has no relation to security issues. Therefore, the common defense and security is not impacted by these exemptions.

Special Circumstances

Special circumstances, in accordance with 10 CFR 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 10 CFR Part 50, Appendix G and 10 CFR 50.61 is to protect the integrity of the reactor coolant pressure boundary by ensuring that each RPV material has adequate fracture toughness. Therefore, since the underlying purpose of 10 CFR Part 50, Appendix G and 10 CFR 50.61 is achieved by an alternative methodology for evaluating RPV material fracture toughness, the special circumstances required by 10 CFR 50(a)(2)(ii) for the granting of an exemption from portions of the requirements of 10 CFR Part 50, Appendix G and 10 CFR 50.61 exist.

4.0 ENVIRONMENTAL CONSIDERATION

The exemptions would authorize exemptions from portions of the requirements of 10 CFR Part 50, Appendix G and 10 CFR 50.61 to allow the licensee to use an alternate methodology to incorporate fracture toughness test data for evaluating the integrity of the TMI-1 Linde 80 weld materials in the TMI-1 RPV beltline based on the use of the 1997 and 2002 editions of ASTM E 1921 and ASME Code Case N-629. Using the standard set forth in 10 CFR 50.92 for amendments to operating licenses, the NRC staff determined that the subject exemptions sought involve use of an alternate methodology to evaluate the integrity of the TMI-1 RPV Linde 80 beltline materials. The NRC has determined that these exemptions involve no significant hazards considerations:

(1) The proposed exemptions are limited to allowing the licensee to use an alternative to the C_v and drop weight-based methodology required by 10 CFR Part 50, Appendix G and 10 CFR 50.61 to evaluate the integrity of the TMI-1 Linde 80 weld materials in the TMI-1 RPV beltline. The alternate methodology does not involve any physical changes to the facility and does not alter the design, function or operation of any plant equipment. Therefore, issuance of this exemption does not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) The proposed exemption does not make any changes to the facility and would not create any new accident initiators. Therefore, this exemption does not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) The proposed exemption does not alter the design, function or operation of any plant equipment. Therefore, this exemption does not involve a significant reduction in a margin of safety.

Based on the above, the NRC has concluded that the proposed exemptions do not involve significant hazards considerations under the standards set forth in 10 CFR 50.92, and accordingly, a finding of “no significant hazards consideration” is justified.

The NRC staff has also determined that the exemptions involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite; that there is no significant increase in individual or cumulative occupational radiation exposure; that there is no significant construction impact; and there is no significant increase in the potential for or consequences from a radiological accident.

The NRC staff has further determined that the requirements from which the exemptions are sought involve the factors associated with 10 CFR 51.22(c)(25)(vi)(C) – inspection or surveillance requirements. Specifically, the exemptions address the methodology used to develop the allowable pressure and temperature criteria for determining reactor coolant system heatup/cooldown and inservice leak and hydrostatic testing in accordance with Technical Specification 3.1.2, “Pressurization Heatup and Cooldown Limitations.” Therefore, the criteria specified in 51.22(c)(25)(vi)(C) is satisfied and, accordingly, the exemption meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(25). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is required to be prepared in connection with the issuance of the exemption.

5.0 CONCLUSION

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the exemptions are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security. Also, special circumstances are present. Therefore, the Commission hereby grants Exelon exemptions from the requirements of Appendix G to 10 CFR Part 50 and 10 CFR 50.61, to allow an alternative methodology that is based on using fracture toughness test data to determine initial, unirradiated properties for evaluating the integrity of the TMI-1 RPV beltline welds.

This exemption is effective upon issuance.

Dated at Rockville, Maryland, this 13th day of December 2013.

FOR THE NUCLEAR REGULATORY COMMISSION

/ra/

Michele G. Evans, Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation