NUCLEAR REGULATORY COMMISSION

Docket Nos. 50-454; 50-455; 50-456; 50-457

Exelon Generation Company, LLC

Byron Station, Unit Nos. 1 and 2, and Braidwood Station, Units 1 and 2

Exemption

I. Background.

Exelon Generation Company, LLC (Exelon, the licensee), holds Renewed Facility Operating License Nos. NPF-37 and NPF-66, which authorize operation of the Byron Station, Unit Nos. 1 and 2 (Byron), a pressurized-water reactor facility, located in Ogle County, Illinois and Renewed Facility Operating License Nos. NPF-72 and NPF-77, which authorize operation of the Braidwood Station, Units 1 and 2 (Braidwood), a pressurized-water reactor facility, located in Will County, Illinois. The licenses, among other things, subject the facilities to all rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (NRC, the Commission) now or hereafter in effect.

By letter dated September 30, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19275E307), Exelon requested exemptions from specific requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," and 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements," for Braidwood and Byron. The requested exemptions from these requirements would allow use of an alternative methodology to determine reactor coolant system pressure-temperature limits. The new methodology that Exelon intends to use is described in AREVA NP Topical Report BAW-2308, Revisions 1-A and 2-A, "Initial RT_{NDT} of Linde 80 Weld Materials" (BAW-2308) (ADAMS

Accession No. ML032380449 and ML081270388). BAW-2308 was approved for referencing in plant specific license amendments by NRC letters dated August 4, 2005 (ADAMS Accession No. ML052070408), and March 24, 2008 (ADAMS Accession No. ML080770349).

II. Request/Action.

Pursuant to 10 CFR, Part 50, Section 50.61, “Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events,” and 10 CFR Part 50, Appendix G, “Fracture Toughness Requirements,” the Commission’s regulations establish specific fracture toughness requirements for nuclear power plant reactor pressure vessels (RPVs). In its letter dated September 30, 2019, Exelon requested exemptions from these requirements to allow use of an alternative methodology described in BAW-2308. BAW-2308 provides an alternate methodology for evaluating the integrity of certain RPV beltline welds, at Braidwood and Byron. The methodology described in BAW-2308, utilized fracture toughness test data based on the use of the 1997 and 2002 editions of American Society for Testing and Materials (ASTM) Standard Test Method E 1921, "Standard Test Method for Determination of Reference Temperature T_0, for Ferritic Steels in the Transition Range," and American Society for Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Code Case N-629, "Use of Fracture Toughness Test Data to establish Reference Temperature for Pressure Retaining materials of Section III, Division 1, Class 1."

In order to use the BAW-2308 methodology, an exemption is required since Appendix G to 10 CFR Part 50, through reference to Appendix G to Section XI of the ASME Code pursuant to 10 CFR 50.55(a), requires the use of a methodology based on Charpy V-notch ($C_{v)}$ and drop weight data.

The licensee also requested an exemption from 10 CFR 50.61 to use an alternate methodology to allow the use of fracture toughness test data for evaluating the integrity of certain Braidwood and Byron, RPV beltline welds based on the use of the 1997 and 2002 editions of ASTM E 1921 and ASME Code Case N-629. An 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 for establishing the pressurized thermal shock (PTS) reference temperature (RT_{PTS}). 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 and 10 CFR 50.61, and does not exempt the licensee from meeting any other requirement of 10 CFR Part 50, Appendix G and 10 CFR 50.61.

Similar exemptions have been issued for Point Beach Nuclear Plant, Units 1 and 2 (ADAMS Accession No. ML14126A594), and Three Mile Island Nuclear Station, Unit 1 (ADAMS Accession No. ML13324A086).

III. Discussion.

Pursuant to 10 CFR 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, as defined in 10 CFR 50.12(a)(2). In its letter dated September 30, 2019, Exelon stated that the requested exemptions meet the special circumstances of 10 CFR 50.12(a)(2)(ii), since application of the methodology in BAW-2308, in this particular circumstance serves the underlying purpose of the regulations.

A. The Exemption is Authorized by Law

This exemption would allow the use of an alternate methodology to make use of fracture toughness test data for evaluating the integrity of the Braidwood, Units 1 and 2, and Byron, Units 1 and 2, RPV Linde 80 beltline materials and would not result in changes to operation of the units. 10 CFR 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. 10 CFR 50.12(a) allows the NRC to grant exemptions from the requirements of 10 CFR Part 50, Appendix G, and 10 CFR 50.61. The NRC staff has determined that granting the exemption will not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations. Therefore, the NRC staff determined that the exemption is authorized by law.

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

The NRC letter dated August 4, 2005, required licensees to meet six conditions and limitations to use the methods of BAW-2308 Revision 1-A. The NRC letter dated March 24, 2008, did not add any additional conditions and limitations to be resolved.

Condition (1): By its letter dated September 30, 2019, the licensee provided WCAP-18370-NP, "Braidwood Units 1 and 2 Heatup and Cooldown Limit Curves for Normal Operation," and WCAP-18371-NP, "Byron Units 1 and 2 Heatup and Cooldown Limit Curves for Normal Operation." Appendix G of both WCAP reports discuss the applicability of BAW-2308 to Braidwood and Byron Linde 80 nozzle-to-shell welds. The licensee compared the weld material properties of its Linde 80 nozzle-to-shell welds to the Linde 80 welds evaluated in BAW-2308. The licensee determined that the specific heats relevant to the Braidwood and Byron Unit 1 and 2 Linde 80 nozzle-to-shell welds

were not analyzed, therefore, the generic "all heats" IRT_{To} and σ_1 values were used. The NRC staff reviewed the weld material properties of the licensee welds to those in BAW-2308 and confirmed that the use of the generic values was appropriate. Therefore, the staff determined that the licensee meets Condition (1).

Condition (2): Section 7 in both WCAP reports discuss its evaluation using RG 1.99, Revision 2 method to determine the shift in the initial properties. Section 5 of both WCAP reports provide the licensee's calculation of the chemistry factors, with Tables 5-4 and 5-5 of both reports providing the summary of chemistry factors. The NRC staff reviewed the chemistry factors and confirmed that the licensee used values greater than 167°F. The licensee provided its calculated adjusted reference temperature (ART) results in Tables 7-5 and 7-8 for the extended beltline materials, including the calculated ΔRT_{NDT}. The staff conducted confirmatory calculations and verified the licensee's calculated values using RG 1.99, Revision 2 and the chemistry factors. Therefore, the staff determined that the licensee meets Condition (2).

Condition (3): Tables 7-5 and 7-8 in both WCAP reports also provides the σ_I and σ_Δ values used to calculate the ART for the extended beltline materials. The NRC staff confirmed that the licensee used the σ_I value from Table 3 of the NRC letter dated August 4, 2005, and σ_Δ value of 28°F for the Linde 80 nozzle-to-shell welds. Therefore, the NRC staff determined that the licensee meets Condition (3).

Condition (4): In its letter dated September 30, 2019, the licensee requested an exemption, per 10 CFR 50.12 and 10 CFR 50.60(b), from the requirements of Appendix G to 10 CFR Part 50 and 10 CFR 50.61 in Attachment 4 of the September 30, 2019, submittal. As part of its exemption request, the licensee submitted information which demonstrates the values the licensee proposes to use for ΔRT_{NDT} and the margin term for each Linde 80 weld in its RPV through the end of its facility's current operating

license. The exemption is addressed herein. Therefore, the NRC staff determined that the licensee meets Condition (4).

Conditions (5) and (6) were resolved in BAW-2308, Revision 2, as documented in the NRC letter dated March 24, 2008.

Based on the NRC reviews documented in its letters dated August 4, 2005, and March 24, 2008, and conformance to the conditions and limitations as described above, the NRC staff concludes that the use of BAW-2308, Revisions 1-A and 2-A, does not increase the probability of occurrence or the consequences of an accident at Braidwood or Byron and will not create the possibility for a new or different type of accident that could pose a risk to public health and safety.

Based on the above, the NRC finds that the action does not cause undue risk to public health and safety.

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

The requested exemption is specifically concerned with RPV material properties and is consistent with guidance specified in the approved Topical Report BAW-2308. The exemption does not change any site security conditions or requirements. Therefore, the NRC finds that the action is consistent with the common defense and security.

D. Special Circumstances

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. Application of ASME Code, Section III, paragraph NB-2331, in the determination of initial material properties was conservatively developed based on the level of knowledge existing in the early 1970's concerning RPV materials and the estimated effects of operation.

Since the early 1970's, the level of knowledge concerning these topics has greatly expanded. This increased knowledge level permits relaxation of the ASME Code, Section lll, paragraph NB-2331, requirements via application of BAW-2308, while maintaining the underlying purpose of the NRC regulations to ensure that an acceptable margin of safety is maintained.

Based on the above, the NRC finds that use of BAW-2308 serves the underlying purpose of the regulation in protecting the integrity of the reactor coolant pressure boundary by ensuring that the RPV materials have adequate fracture toughness. The NRC staff has determined that BAW-2308 applies to the RPV materials at Braidwood and Byron, and that its use at these facilities is acceptable. The NRC therefore determines that the special circumstances required by 10 CFR 50.12(a)(2)(ii) are present at Braidwood and Byron.

E. Environmental Considerations

The NRC's approval of the exemption to 10 CFR Part 50, Appendix G, and 10 CFR 50.61 belongs to a category of actions that the NRC, by rule or regulation, has declared to be a categorical exclusion, after first finding that the category of actions does not individually or cumulatively have a significant effect on the human environment. Specifically, the exemption is categorically excluded from further environmental analysis under 10 CFR 51.22(c)(9).

Under 10 CFR 51.22(c)(9), the granting of an exemption from the requirements of any regulation of chapter 10 of the Code of Federal Regulations (10 CFR) is a categorical exclusion provided that: (i) the 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.

In its letter dated August 4, 2005, the NRC concluded that BAW-2308, Revision 1, represents an acceptable methodology for establishing weld wire heat specific and generic IRT_{T0} values for Linde 80 welds. In its letter dated March 24, 2008, the NRC concluded that that the slightly modified Pressurized-Water Reactor Owner's Group initial RT_{NDT} methodology and the revised IRT_{T0} and σ_1 values in BAW-2308, Revision 2, are acceptable for estimating the IR_{T0} and σ_1 values for various heats of the Linde 80 welds in future RPV integrity evaluations in license applications. Based on the above, the NRC staff has determined that the granting of the exemption request involves no significant hazards consideration because it does not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. Further, the NRC staff has determined that issuance of the exemptions will not result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or a significant increase in individual or cumulative occupational radiation exposure.

Therefore, pursuant to 10 CFR 51.22(b) and (c)(9), no environmental impact statement or environmental assessment need be prepared in connection with the approval of this exemption request.

IV. Conclusions.

Accordingly, the NRC 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 (see Special Circumstances above). Therefore, the NRC hereby grants Exelon Generation Company, LLC, exemptions for Byron and Braidwood, from 10 CFR Part 50, Appendix G, and 10 CFR 50.61 to allow the use of AREVA NP

Topical Report BAW-2308, Revisions 1-A and 2-A, "Initial RT_{NDT} of Linde 80 Weld Materials."

Dated at Rockville, Maryland, this 31st day of August, 2020

For the Nuclear Regulatory Commission.

Gregory F. Suber

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