

# **NUCLEAR REGULATORY COMMISSION**

**Docket Nos. 50-254 and 50-265**

**Exelon Generation Company, LLC and MidAmerican Energy Company**

**Quad Cities Nuclear Power Station, Units 1 and 2**

**Exemption**

## **I. Background.**

Exelon Generation Company, LLC (EGC, the licensee) and MidAmerican Energy Company are the holders of Facility Operating License Nos. DPR-29 and DPR-30, which authorize operation of the Quad Cities Nuclear Power Station (QCNPS), Units 1 and 2. The licenses provide, among other things, that the facilities are subject to the rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (NRC, the Commission) now or hereafter in effect. The facilities each consist of a boiling, light-water reactor located in Rock Island County, Illinois.

## **II. Request/Action.**

In its letter dated March 5, 2019 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML19064B369), as supplemented by letters dated May 23, 2019 (ADAMS Accession No. ML19143A347), July 22, 2019 (ADAMS Accession No. ML19203A176), February 24, 2020 (ADAMS Accession No. ML20055E826), and March 31, 2020 (ADAMS Accession No., ML20091H576) EGC requested a permanent exemption from the Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), Appendix J, Option B, Section III.A requirements in order to permit exclusion of main steam isolation valve (MSIV) leakage from the overall integrated leak rate Type A test measurement, and from Option B, Section III.B,

requirements in order to permit exclusion of the MSIV pathway leakage contributions from the combined leakage rate of all penetrations and valves subject to Type B and Type C tests. The letters also requested license amendments to revise Technical Specification (TS) 3.6.1.3, "Primary Containment Isolation Valves (PCIVs)," Surveillance Requirement (SR) 3.6.1.3.10 that would increase the single and combined MSIV leakage rate limits; add a new TS 3.6.2.6, "Residual Heat Removal (RHR) Drywell Spray," to reflect the crediting of drywell spray for fission product removal; and revise TS 3.6.4.1, "Secondary Containment," SR 3.6.4.1.1 to address short-duration conditions during which the secondary containment pressure may not meet the SR pressure requirement at QCNPS, Units 1 and 2. The license amendment requests are addressed separately.

Under Part 50 of 10 CFR, paragraph 50.54(o), primary reactor containments for water-cooled power reactors are subject to the requirements of Appendix J to 10 CFR Part 50. Appendix J specifies the leakage rate test requirements, schedules, and acceptance criteria for tests of the leak-tight integrity of the reactor containment, and systems and components that penetrate the containment. Option B of 10 CFR 50, Appendix J, "Performance-Based Requirements," paragraph III.A, "Type A Test," requires, among other things, that the overall integrated leakage rate must not exceed the allowable leakage rate ( $L_a$ ) with margin, as specified in the TSs. The overall integrated leakage rate is defined in 10 CFR Part 50, Appendix J, as "the total leakage rate through all tested leakage paths, including containment welds, valves, fittings, and components that penetrate the containment system." This includes the contribution through the four main steam (MS) lines where each line contains two MSIVs in series. Paragraph III.B, "Type B and C Tests," requires, among other things, that the sum of the leakage rates of Type B and Type C local leakage rate tests be less than the performance criterion ( $L_a$ ) with margin as specified in the TSs. The allowable leakage rates set in the TSs ensure that the required dose limits, such as in 10 CFR 50.67, "Accident source term," will not be exceeded.

This requested exemption concerns the MS system, which penetrates containment. The licensee requested this exemption because the MS pathway leakage is treated separately from the remainder of the assumed leakage from primary containment in the design basis loss of coolant accident (LOCA) analysis. The radiological consequences of MSIV leakage are modeled as a separate primary containment release path to the environment that bypasses secondary containment, and therefore, it is not filtered through the standby gas treatment system like other containment leakage. The design basis LOCA dose calculation assumes all MSIV leakage migrates to the turbine building and then to the environment. By currently including the MS pathway leakage with the rest of the primary containment leakage test results, it is being accounted for twice—once as part of the actual containment leakage and again as part of the MSIV leakage used in the LOCA dose calculations.

### **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 as described in 10 CFR 50.12(a)(2)(i)-(vi) are present. The licensee asserted that special circumstances are present under 10 CFR 50.12 (a)(2)(ii) (stating that the application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule).

The licensee's exemption request was submitted with license amendments request to increase the allowable MSIV leakage rate. The exemption and amendments together will permit an increase in allowable MSIV leakage rate that is excluded from the overall integrated leak rate Type A test measurement and excluded from the combined Type B and Type C test total. The

licensee described its view on the special circumstances associated with the MSIV leakage path testing in its application dated July 22, 2019.

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

This exemption permits exclusion of the MSIV pathway leakage contribution from the overall integrated leakage rate Type A test measurement and from the combined leakage rate of all penetrations and valves subject to Type B and Type C tests. As stated above, 10 CFR 50.12 allows the NRC to grant exemptions from the requirements of 10 CFR Part 50. The NRC staff has determined that granting of the licensee's proposed exemption will 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. The Exemption Presents no Undue Risk to Public Health and Safety.**

Type A tests to measure the containment system overall integrated leakage rate must be conducted under conditions representing design basis LOCA containment peak pressure. Type B pneumatic tests to detect and measure local leakage rates across pressure retaining, leakage-limiting boundaries, and Type C pneumatic tests to measure containment isolation valve leakage rates, must be conducted to ensure the integrity of the overall containment system as a barrier to fission product release to reduce the risk from reactor accidents.

In license Amendment Nos. 233 and Amendment 229 (ADAMS Accession No. ML062070290), the NRC approved the use of the alternative source term (AST) (as prescribed in 10 CFR 50.67) in the calculations of the radiological dose consequences of design basis accidents (DBAs), including the design basis LOCA, for QCNPS, Units 1 and 2. The NRC staff safety evaluation accompanying these amendments acknowledged that once fission products are dispersed in the primary containment, their release to the environment is assumed to occur through three pathways: (1) the leakage of primary containment atmosphere; (2) the leakage of

primary containment atmosphere through MSIVs; and (3) the leakage from emergency core cooling systems that recirculate suppression pool water outside of the primary containment. As noted above, however, leakage through the MSIVs is considered a separate pathway and is calculated as a separate contributor to the dose consequence analysis. As such, the inclusion of MSIV leakage as part of Type A and as part of Type B and C test results is not necessary to ensure the actual radiological consequences of DBAs remain below the regulatory limit.

The proposed exemption does not create any new accident precursors. Therefore, the probability of postulated accidents is not increased. Also, the consequences of postulated accidents are not significantly changed from the previously evaluated consequences associated with the design basis LOCA as described in the AST amendments. Therefore, there is no undue risk to public health and safety.

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

The proposed exemption excludes the MSIV pathway leakage contribution from the overall integrated leakage rate Type A test measurement and from the combined leakage rate of all penetrations and valves subject to Type B and Type C tests. This change to accounting for leakage rate measurement has no relation to security issues. Therefore, the exemption is consistent with the common defense and security.

**D. Special Circumstances.**

Under 10 CFR 50.12(a)(2)(ii) special circumstances include when, “[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.”

The test requirements in Appendix J to 10 CFR Part 50 ensure that leakage through containments or systems and components penetrating containments does not exceed allowable leakage rates specified in the technical specifications, and integrity of the containment structure

is maintained during its service life. Option B of Appendix J identifies the performance-based requirements and criteria for preoperational and subsequent periodic leakage-rate testing.

The licensee has analyzed the MS pathway leakage separately from the overall containment integrated leakage; the local leakage across pressure-containing or leakage-limiting boundaries; and the containment isolation valve leakage in its dose consequence analyses. The dose consequences were found to be within the applicable acceptance criteria in 10 CFR 50.67, "Accident source term," and the guidance of NRC Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents [DBAs] at Nuclear Power Reactors," dated July 2000 (ADAMS Accession No. ML003716792). The staff has reviewed the licensee's analysis and determined that the dose consequences of implementing the proposed change are below the applicable acceptance criteria and the containment leaks will continue to be limited by the QCNPS, Units 1 and 2, TSs.

Therefore, because the underlying purposes of 10 CFR Part 50, Appendix J, is still achieved, the special circumstances required by 10 CFR 50.12(a)(2)(ii) for the granting of an exemption from 10 CFR Part 50, Appendix J, Option B, Sections III.A and III.B, exist.

## **E. Environmental Considerations**

The NRC staff determined that the issuance of the requested exemption meets the provisions of categorical exclusion 10 CFR 51.22(c)(25) because: (i) no significant hazards consideration; (ii) no significant change in the types or significant increase in the amounts of any effluents that may be released offsite; (iii) no significant increase in individual or cumulative public or occupational radiation exposure; (iv) there is no significant construction impact; (v) there is no significant increase in the potential for or consequences from radiological accidents; and (vi) the requirements from which an exemption is sought involve e.g., inspection or surveillance requirements. Therefore, in accordance with 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the NRC's

issuance of this exemption. The basis for the NRC staff's determination is provided in the following evaluation of the requirements in 10 CFR 51.22(c)(25)(i)-(vi).

Requirements in 10 CFR 51.22(c)(25)(i)

To qualify for a categorical exclusion under 10 CFR 51.22(c)(25)(i), the exemption must involve "no significant hazards consideration." The NRC staff evaluated whether the exemption involves no significant hazards consideration by using the standards in 10 CFR 50.92(c), as presented below:

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

Response: No.

The proposed exemption would permit exclusion of the MSIV pathway leakage contribution from the overall integrated leakage rate Type A test measurement and from the sum of the leakage rates from Type B and Type C tests. The leakage of primary containment atmosphere through MSIVs is accounted for as a separate contributor to the design basis LOCA dose consequence analysis. This exemption will allow the leakage testing to be performed in a manner consistent with the way MSIV leakage is modeled in the revised radiological consequence analysis included as part of the related license amendment requests (LARs) submitted in the letter dated March 5, 2019 as supplemented by the letters dated March 23, 2019, February 24, 2020, and March 31, 2020. This change to the leakage rate measurement does not increase the probability or consequences of an accident previously evaluated.

Therefore, the exemption does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No.

The proposed exemption does not involve a physical modification to the plant (i.e., no new or different type of equipment will be installed and there are no physical modifications to existing equipment associated with the proposed change). Similarly, it does not physically change any structures, systems, or components involved in the mitigation of any accidents.

Therefore, the exemption does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

Response: No.

The proposed exemption does not alter a design basis or safety limit nor cause a limit to be exceeded. The proposed exemption allows the results of the TS required MSIV leakage pathway tests to no longer be accounted for as part of the overall integrated leakage rate Type A test measurement and as part of the sum of the local leakage rates from Type B and Type C tests. This change only affects which leakage rates are included in the Types A, B, and C results. This exemption will allow the leakage testing to be performed in a manner consistent with the way MSIV leakage is modeled in the revised radiological consequence analysis submitted as part of the related LAR.

Therefore, the exemption does not involve a significant reduction in a margin of safety.

Based on the evaluation above, the NRC staff has determined that the proposed exemption involves no significant hazards consideration. Therefore, the requirements of 10 CFR 51.22(c)(25)(i) are met.

Requirements in 10 CFR 51.22(c)(9)(ii)

To qualify for a categorical exclusion under 10 CFR 51.22(c)(25)(ii), the exemption must result in “no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.” The proposed exemption allows the results of the TS-required MSIV leakage pathway tests to be accounted for only as part of the design basis LOCA



consequence analysis. This change only affects the total in which the leakage rates are included and does not change the frequency or pressure at which the testing must be performed. The underlying purpose of 10 CFR Part 50, Appendix J, is to demonstrate by periodic testing and visual inspection that the primary reactor containment will be able to perform its function of providing an essentially leak-tight barrier against uncontrolled release of radioactivity to the environment. The inclusion of the MSIV leakage testing results in the design basis LOCA serves the same purpose as the inclusion in the rate Type A test measurement and the sum of the leakage rates from Type B and Type C tests required by Appendix J, Option B, paragraphs III.A and III.B. Therefore, the proposed exemption 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 requirements of 10 CFR 51.22(c)(25)(ii) are met.

Requirements in 10 CFR 51.22(c)(9)(iii)

To qualify for a categorical exclusion under 10 CFR 51.22(c)(25)(iii), the exemption must result in “no significant increase in individual or cumulative public or occupational radiation exposure.” The proposed exemption permits the exclusion of the MSIV leakage pathway results from the Type A test measurement and the sum of the leakage rates from Type B and Type C tests required by Appendix J, Option B, paragraphs III.A and III.B, and has no impact on, or change to, fuel or core design. Additionally, the TSs still require that the MSIV leakage rates be tested and maintained below set limits. As such, the calculated public and occupational doses will remain essentially the same. Therefore, the proposed exemption will not significantly increase individual or cumulative public or occupational radiation exposure. Therefore, the requirements of 10 CFR 51.22(c)(25)(iii) are met.

Requirement in 10 CFR 51.22(c)(25)(iv)

To qualify for a categorical exclusion under 10 CFR 51.22(c)(25)(iv), the exemption must result in “no significant construction impact.” The exemption does not propose any changes to

the site, alter the site, or change the operation of the site. Therefore, there is no significant construction impact. Therefore, the requirements of 10 CFR 51.22(c)(25)(iv) are met.

Requirement in 10 CFR 51.22(c)(25)(v)

To qualify for a categorical exclusion under 10 CFR 51.22(c)(25)(v), the exemption must involve “no significant increase in the potential for or consequences from radiological accidents.” The proposed exemption does not remove the requirement to perform leakage rate testing of the MSIVs. This exemption will allow the leakage testing to be performed in a manner consistent with the way MSIV leakage is modeled in the revised radiological consequence analysis submitted as part of the related LAR. Therefore, this change to the leakage rate measurement does not result in a significant increase in the potential for or consequences from radiological accidents. Therefore, the requirements of 10 CFR 51.22(c)(25)(v) are met.

Requirement in 10 CFR 51.22(c)(25)(vi)

To qualify for a categorical exclusion under 10 CFR 51.22(c)(25)(vi)(C), the exemption must involve inspection or surveillance requirements. The exemption seeks to permit exclusion of the MSIV leakage from the overall integrated leak rate Type A test measurement and the combined leakage rate of all penetrations and valves subject to Type B and Type C tests required by Appendix J to 10 CFR part 50. Appendix J specifies the leakage rate test requirements, schedules, and acceptance criteria for tests of the leak-tight integrity of the reactor containment, and systems and components that penetrate the containment. Therefore, the exemption involves a surveillance requirement. Therefore, the requirements of 10 CFR 51.22(c)(25)(vi) are met.

Conclusion

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)(25). Therefore, in accordance with 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the NRC's issuance of this exemption.

#### **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. Therefore, the NRC hereby grants EGC a permanent exemption (1) from the requirements of 10 CFR Part 50, Appendix J, Option B, Section III.A, to allow exclusion of the MSIV pathway leakage from the overall integrated leakage rate measured when performing a Type A test; and (2) from the requirements of 10 CFR Part 50, Appendix J, Option B, Section III.B, to allow exclusion of the MSIV pathway leakage from the combined leakage rate of all penetrations and valves subject to Types B and C tests for QCNPS, Units 1 and 2.

This exemption is effective upon issuance.

Dated: 18th day of June 2020.

FOR THE NUCLEAR REGULATORY COMMISSION

Craig G. Erlanger, Director  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation