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Order No. EA-12-049

TMI-19-110

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Three Mile Island Nuclear Station, Unit 1
Renewed Facility Operating License No. DPR-50
NRC Docket No. 50-289

Subject: Request for Withdrawal of Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)

References:

1) NRC Order EA-12-049, Issuance of Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012 (Accession No. ML12054A73)
2) Letter from Exelon Generation Company, LLC, Report of Full Compliance with March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Accession No. ML12054A735)
3) NRC Letter to Exelon Generation Company, LLC, Three Mile Island Nuclear Station, Unit 1 - Safety Evaluation Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (CAC Nos. MF0803, and MF0866), dated February 14, 2017 (Accession No. ML17025A0409)
4) NRC Letter to Exelon Generation Company, LLC, Three Mile Island Nuclear Power Plant, Unit 1 - Temporary Instruction 2515/191 Inspection Report 05000289/2017010, dated September 11, 2017 (Accession No. ML17255A131)
5) Letter from Exelon Generation Company, LLC, Certification of Permanent Cessation of Power Operations for Three Mile Island Nuclear Station, dated June 20, 2017 (Accession No. ML17171A151)

6) Letter from Exelon Generation Company, LLC, Certification of Permanent Removal of Fuel from the Reactor Vessel for Three Mile Island Nuclear Station, Unit 1, dated September 26, 2019 (Accession No. ML19269E480)

The purpose of this letter is to request the U.S. Nuclear Regulatory Commission (NRC) to withdraw Order EA-12-049, *"Issuance of Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events"* (Mitigation Strategies Order) (Reference 1) in its entirety in accordance with Section IV of the SFPI Order. This section provides the Director, Office of Nuclear Reactor Regulation means to rescind any of the order conditions upon demonstration by the Licensee of good cause.

On March 12, 2012, the NRC issued Order EA-12-049, (Reference 1) to all power reactor licensees. In Reference 2, Exelon Generation Company, LLC (Exelon) provided the required report of full compliance with Order EA-12-049 and the associated Final Integrated Plan describing the strategies capable of mitigating a simultaneous loss of all alternating current (AC) power and loss of normal access to the ultimate heat sink resulting from a Beyond-Design-Basis External Events (BDBEE) by providing adequate capability to maintain or restore core cooling, containment, and Spent Fuel Pool (SFP) cooling capabilities at Three Mile Island Nuclear Station, Unit 1 (TMI-1).

In Reference 3, the NRC provided the results of their review of the strategies and equipment provided to maintain or restore core cooling, SFP cooling, and containment following a BDBEE at TMI-1 and concluded that the design adequately addressed the requirements of Order EA-12-049. In Reference 4, the NRC verified that TMI-1 had adequately implemented the mitigation strategies as described in the licensee's Final Integrated Plan and that TMI-1 is in compliance with Order EA-12-049.

The request to withdraw the Mitigation Strategies Order EA-12-049 is based upon good cause in that TMI-1 has permanently shutdown and removed all of the fuel from the reactor vessel (References 5 and 6) and that sufficient time will have passed such that the decay heat load in the SFP has sufficiently decreased to a point where the order requirements for maintaining the SFP cooling safety function after a BDBEE are not necessary. The attachments to this letter provide good cause justification to support Exelon's request.

There are no regulatory commitments contained in this submittal.

If you have any questions concerning this submittal, please contact Leslie Holden at (630) 657-2524.

Respectfully,

Michael P. Gallagher
Vice President, License Renewal & Decommissioning
Exelon Generation Company, LLC

Attachments:

1) Request for Withdrawal of Commission Order Modifying Licenses Regarding Requirements for Mitigation Strategies for Beyond-Design-Basis External Events
2) Discussion of Computation of Time to 10-Feet Above Top of Active Fuel

cc: Regional Administrator – NRC Region I
NRC Project Manager, NRR – TMI-1
Director, Bureau of Radiation Protection - PA Department of Environmental Resources

ATTACHMENT 1

Request for Rescission of Commission Order Modifying Licenses Regrading Requirements for Mitigation Strategies for Beyond-Design-Basis External Events *(NRC Order Number EA-12-049)*

1. REGULATORY DISCUSSION

On March 12, 2012, the U. S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, *"Issuance of Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events"* (Mitigation Strategies Order) (Reference 4.1) to all power reactor licensees. Order EA-12-049 directed Exelon Generation Company, LLC (Exelon) to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities in the event of a beyond-design-basis external event (BDBEE) at TMI-1. Specific requirements of the Order were contained in Attachment 2 of Reference 4.1.

In Reference 4.2, Exelon provided the required report of full compliance with Order EA-12-049 and the associated Final Integrated Plan describing the strategies capable of mitigating a simultaneous loss of all alternating current (AC) power and loss of normal access to the ultimate heat sink resulting from a BDBEE by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at TMI-1.

In Reference 4.3, the NRC provided the results of their review of the strategies and equipment provided to maintain or restore core cooling, SFP cooling, and containment following a BDBEE at TMI and concluded that the design adequately addressed the requirements of Order EA-12-049. In Reference 4.4, the NRC verified that TMI-1 had adequately implemented the mitigation strategies as described in the licensee's Final Integrated Plan and determined that TMI-1 is in compliance with Order EA-12-049.

In Reference 4.5, Exelon provided formal notification in accordance with 10 CFR 50.82(a)(1)(i) to the NRC, that Exelon had determined to permanently cease operations at TMI-1 on or about September 30, 2019. In Reference 4.6, Exelon provided formal notification in accordance with 10 CFR 50.82(a)(1)(ii), and certified that as of September 26, 2019, all fuel has been permanently removed from the TMI-1 reactor vessel and placed in the SFP. As stated in 10 CFR 50.82(a)(2), upon docketing the certifications for permanent cessation of operations and permanent removal of fuel from the reactor vessel, the 10 CFR Part 50 license for TMI-1 no longer authorizes operation of the reactor or emplacement or retention of fuel into the reactor vessel.

2. GOOD CAUSE BASIS FOR WITHDRAWAL REQUEST

2.1. Site Specific Considerations

As provided in Section IV of the Mitigation Strategies Order, the Director, Office of Nuclear Reactor Regulation, may rescind any of the order conditions upon demonstration by the Licensee of good cause. The NRC has previously found ensuring the boiloff of SFP inventory to 10 feet above Top of Fuel in a 7-day period would provide adequate time to respond to the event acceptable in withdrawing Order EA-12-049 for Oyster Creek Nuclear Generating Station (Reference 4.7). Seven (7) days provides an adequate amount of time to be available in order to respond to any extended loss of power impacting the normal SFP cooling system, such as what could occur following a beyond-design-basis external event (BDBEE), prior to water level reaching a point where it may no longer maintain substantial shielding for a person standing on the SFP operating deck.

Section III of the Mitigation Strategies Order states that the Commission determined that all power reactor licensees and construction permit holders must develop, implement and maintain guidance and strategies to restore or maintain core cooling, containment, and spent fuel pool cooling capabilities in the event of a BDBEE. This statement forms the basis of the Mitigation Strategies Order and reflects the need to effectively deploy limited resources to mitigate very low frequency events with the potential to challenge the reactor, containment and SFP.

TMI-1 permanently ceased operations on September 20, 2019. As stated above, Exelon has provided formal notification to the NRC in accordance with 10 CFR 50.82(a)(1)(i) and 10 CFR 50.82(a)(1)(ii), that TMI-1 permanently ceased operations and that all fuel has been permanently removed from the TMI-1 reactor vessel and placed in the SFP (References 4.5 and 4.6). The lack of fuel in the reactor vessel and the resulting absence of challenges to the primary containment render the development of guidance and strategies to maintain or restore core cooling and primary containment capabilities unnecessary.

During decommissioning, the SFP cooling system will be maintained to provide SFP cooling until all spent fuel has been transferred to dry storage containers at the onsite Independent Spent Fuel Storage Installation (ISFSI). The seismically qualified SFP cooling system consists of a 2-train redundant system. In the unlikely event resulting in the loss of the SFP cooling system, existing design features and capabilities are available for mitigation until the system can be restored, alternate means of cooling established, or offsite resources obtained.

The SFP pool inherently has a large capacity for heat absorption based on the large volume of water. There is approximately 3.43×10^6 lbm of water available above the elevation of the top of active fuel (318.75 ft). Once the TMI-1 reactor has been shutdown for more than 56-days it would take more than 7 days to boil off the SFP water inventory to a point 10 feet above the top of active fuel seated in the SFP storage racks, if there was a complete loss of normal SFP cooling with no makeup. This result is based on the analysis (Reference 4.8) that was previously provided in Reference 4.9. A discussion of how the time to reach the top of active fuel time period was determined is provided in Attachment 2. This analysis assumes a full core offload into the fuel pool (all fuel has been transferred to the pool), only credits the fuel pool water inventory with no make-up and has other conservative assumptions. The greater than 7-day period is based upon the expected maximum heat load at 56 days after permanent shutdown. As such, reliance on SFP inventory for passive cooling provides an equivalent level of protection as that which would be provided by the initial phase of the guidance and strategies for maintaining or restoring SFP cooling per the Mitigation Strategies Order.

Further, the low decay heat and long time to boil off the inventory to a point at which makeup would be necessary for radiation shielding purposes obviate the need for transition phase guidance and strategies using onsite portable equipment per the Mitigation Strategies Order. Existing Extensive Damage Mitigation Guidelines (EDMG) equipment and procedures (formerly required by 10 CFR 50.54(hh)(2) and relocated to 10 CFR 50.155(b)(2)) will be available to provide makeup to the pool and can be deployed prior to the onset of pool boiling. Even without crediting the EDMG equipment, the low decay heat and long time to boil off the inventory also provides sufficient time to obtain offsite resources on an ad hoc basis to sustain SFP cooling indefinitely, obviating the need for the final phase of guidance and strategies per Order EA-12-049. Additionally, memorandums of understanding are in place with the Londonderry Volunteer

Fire Company, as well as other ancillary fire departments with capabilities to support providing makeup cooling water to the SFP in addition to fire suppression and medical response.

Exelon requests that the NRC withdraw Order EA-12-049, in its entirety effective at the end of the 56-day period following permanent shutdown when the decay heat load in the spent fuel pool SFP has sufficiently decreased to a point where the order requirements for maintaining the SFP cooling safety function after a BDBEE are not necessary. The 56-day period will be satisfied on November 15, 2019.

This Order EA-12-049 withdrawal request is consistent with the mitigation strategies phase out provisions of the Mitigation of Beyond-Design-Basis Events (MBDBE) rule (Reference 4.10) § 50.155(a)(2)(i).

3. CONCLUSION OF GOOD CAUSE

The evaluation above demonstrates good cause to support Exelon's request to withdraw Order EA-12-049 (Reference 4.1) based upon the docketing of the 10 CFR 50.82(a)(1) certifications for permanent cessation of operations and permanent removal of fuel from the reactor vessel (References 4.5 and 4.6) and once the reactor has been shutdown for more than 56 days, there will be an adequate amount of time (7-days) available in order to respond to any extended loss of power that would result in the loss of normal SFP cooling and make-up prior to the SFP water level being reduced to 10-feet above the top of active fuel. Since the TMI-1 reactor was permanently shutdown on September 20, 2019, the 56-day decay period will occur on November 15, 2019.

Additionally, the requested Order withdrawal is consistent with the phased approach contained in the NRC MBDBE rule (Reference 4.10).

4. REFERENCES

4.1. NRC Order EA-12-049, Issuance of Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012 (Accession No. ML12054A73)

4.2. Letter from Exelon Generation Company, LLC, Report of Full Compliance with March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order No. EA-12-049), dated June 29, 2016 (Accession No. ML16183A025)

4.3. NRC Letter to Exelon Generation Company, LLC, Three Mile Island Nuclear Station, Unit 1 - Safety Evaluation Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (CAC Nos. MF0803, and MF0866), dated February 14, 2017 (Accession No. ML17025A0409)

4.4. NRC Letter to Exelon Generation Company, LLC, Three Mile Island Nuclear Power Plant, Unit 1 - Temporary Instruction 2515/191 Inspection Report 05000289/2017010, dated September 11, 2017 (Accession No. ML17255A131)

4.5. Letter from Exelon Generation Company, LLC, Certification of Permanent Cessation of Power Operations for Three Mile Island Nuclear Station, dated June 20, 2017 (Accession No. ML17171A151)

4.6. Letter from Exelon Generation Company, LLC, Certification of Permanent Removal of Fuel from the Reactor Vessel for Three Mile Island Nuclear Station, Unit 1, dated September 26, 2019 (Accession No. ML19269E480)

4.7. NRC Letter to Exelon Generation Company, LLC, Oyster Creek Nuclear Generating Station - Withdrawal of Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (EPID NO. L-2018-JLD-0007), dated December 14, 2018 (Accession No. ML 18176A071)

4.8. C-1101-202-E410-476, DECOM Spent Fuel Pool Thermohydraulic Analysis, Revision 1, dated March 6, 2018

4.9. Letter from Michael P. Gallagher, (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission – "*Request for Exemptions from Portions of 10 CFR 50.47 and 10 CFR 50, Appendix E,*" dated July 1, 2019 (Accession No. ML19182A104)

4.10. Nuclear Regulatory Commission: 10 CFR Parts 50 and 52, Mitigation of Beyond-Design Basis Events, Final Rule Federal Register, Vol. 84, No. 154, pgs. 39684-39722, Friday, August 9, 2019

ATTACHMENT 2

Discussion of Computation of Time to 10-Feet Above Top of Active Fuel

(1) Assumed initial SFP level: 343.5 feet (Reference 4.8* @ §4.3.2)†

(2) SFP @ Top of active fuel (TAF): 318.75 feet (Reference 4.8 @ §5.3.2)

(3) 10 feet above TAF:
TAF (2) + 10 feet
318.75 feet +10 feet = 328.75 feet

(4) Mass of water from Time to Boil (TTB) to Time to TAF (TTAF):
3.43E6 lbm (Reference 4.8 @ §5.3.2)

(5) Feet of water available for boiloff =
Initial SFP level (1) – SFP level @ TAF (2)
343.5 feet – 318.75 feet = 24.75 feet

(6) Mass of water per foot of SFP level =
Mass of water to TAF (4) / feet of water to TAF (5)
3.43E6 lbm / 24.75 feet = 138,585.86 lbm/foot

(7) Mass of water to 10 feet above TAF =
Mass of water per foot (6) * (feet of water to TAF (5) - 10 feet)
138,585.86 lbm/foot * (24.75 feet – 10 feet) = 2.04E6 lbm

(8) TTAF @ 56 days: 13.03 days (Reference 4.8 - Appendix 7.3)

(9) Time to reach 10 feet above TAF =
Water mass to 10 feet above TAF (7) / water mass at TAF (4) * TTAF at 56 days (8)
2.04E6 lbm / 3.43E6 lbm * 13.03 days = 7.75 days to reach 10 feet above TAF

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* Reference 4.8 (C-1101-202-E410-476, "DECOM Spent Fuel Pool Thermohydraulic Analysis") was previously submitted to the NRC in Reference 4.9

† References 4.8 and 4.9 used in this Attachment are from the reference list in Attachment 1.