Three Mile Island Nuclear Station, Unit 1
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10 CFR 50.59(d)(2)
NEI 99-04

TMI-22-012

March 24, 2022

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

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

Subject: 2020-2021 Biennial 10 CFR 50.59 and 10 CFR 72.48 Summary Reports and 2021 Commitment Revision Summary Report

This letter submits the 2020-2021 Biennial 10 CFR 50.59 and 10 CFR 72.48 Summary Reports required by 10 CFR 50.59(d)(2) and 10 CFR 72.48(d)(2) and the 2021 Annual Commitment Revision Summary Report required by SECY-00-0045 (NEI 99-04) for Three Mile Island Nuclear Station, Unit 1 (TMI-1).

Attachment 1 provides a report containing a brief description of any changes, tests or experiments, that required a 50.59 evaluation during the reporting period.

Attachment 2 provides a report containing a brief description of any changes, tests or experiments, that required a 72.48 evaluation during the reporting period.

Based on a review of commitment tracking documentation, it has been determined that no new commitment changes were processed and implemented in calendar year 2021.

There are no new regulatory commitments established by this submittal.

Should you have any questions concerning this letter, please contact Mr. Craig W Smith at (717) 948-8776.

Respectfully,

Orth, Trevor L Digitally signed by Orth, Trevor L
Date: 2022.03.24 09:33:12 -04'00'

Trevor L. Orth
Site Decommissioning Director
Three Mile Island Nuclear Station, Unit 1

Attachment 1: TMI-1 50.59 Summary Report
Attachment 2: TMI-1 72.48 Summary Report

cc: w/ Attachments
NRC Regional Administrator - NRC Region I
NRC Project Manager, NMSS Three Mile Island Unit 1
Director, Bureau of Radiation Protection - PA Department of Environmental Resources

Attachment 1

2020-2021 Biennial TMI-1 50.59 Summary Report

**Title:** MIS-A-2B [Fuel Handling Building Crane] RZ [Restricted Zone] Mode Application to AFHT [Auxiliary Fuel Handling Tool] Operation

**Year Implemented:** 2021

**Evaluation Number:** TMI-D-0169

**Description of Activity:**

The proposed Activity, Engineering Change EC 633954, evaluates and modifies programming, provides procedural requirements and provides remote (Wi-Fi) access for the Fuel Handling Building (FHB) Crane (Component ID: MIS- A-2B). This Activity is divided for the purposes of this 50.59 Review according to the below scope items.

1. Evaluates, modifies programming and provides procedural requirements for the MIS-A-2B Restricted Zone (RZ) Mode to restrict lateral travel of the manual Auxiliary Fuel Handling Tool (AFHT) during operation to prevent an accident of a type different from any previously evaluated in the UFSAR (DSAR).

   Lateral (horizontal) movement limits for the FHB crane during use of the AFHT were previously evaluated in a 50.59 Evaluation approved for issuance of procedure 1507-15, Revision 0. That 50.59 Evaluation (1507-15) describes the use of clamp-on mechanical hard stops on the crane runway rails and monorail trolley rail when the AFHT is in use, as a means to prevent an accident of a type different from any previously evaluated in the Decommissioning Safety Analysis Report (DSAR). Steps were included in procedure 1507-15 to ensure the installation of these hard stops prior to using the AFHT to handle irradiated fuel.

   This Activity establishes the RZ Mode boundaries and procedural requirements for use of the MIS-A-2B RZ Mode of operation during AFHT operation to be implemented through revision of Procedure 1507-15 in place of the previously evaluated mechanical hard stops.

2. Authorizes permanent installation of the non-internet connected Wi-Fi router for access to the MIS-A-2B PanelView (Human Machine Interface).

**Reason for Activity:**

TMI-1 utilizes an AFHT to move irradiated fuel within the 'A', 'B' Spent Fuel Pools (SFP), and cask loading pit. Operation of the AFHT is controlled by procedure 1507-15, Manual Auxiliary Fuel Handling Tool Operation.

EC 625307 installed a new FHB Crane (MIS-A-2B). EC 625310 revised the DSAR to include a description of the RZ positioning control system on MIS-A-2B. MIS-A-2B is equipped with two positioning limit devices to locate the horizontal position of the crane’s monorail hoist over the SFP and programming which created Restricted Zones of operation (RZ Mode). EC 625307 did not evaluate MIS-A-2B RZ Mode of operation for use with the AFHT. RZ mode of operation is desired to be deployed during use of the AFHT in accordance with 1507-15 instead of the

previously evaluated (50.59 1507-15) hard stops.

The installation of the non-internet connected Wi-Fi router allows remote 'operator' level access to the MIS-A-2B HMI and to toggle select functions, including RZ Mode, without physically accessing the crane.

**Effect of Activity:**

Fuel handling utilizing the AFHT suspended from the MIS-A-2B monorail hoist is different than previously evaluated by 50.59 (1507-15) for the AFHT suspended from MIS-A-2 supplemental hoist and documented in procedure 1507- 15.

The modified MIS-A-2B RZ Mode in conjunction with the AFHT as implemented through the revision of procedure 1507-15 ensures that appropriate design and administrative controls are in place to control fuel handling and loading of the MAGNASTOR system using the AFHT and RZ Mode to maintain all licensing and design bases and to prevent an accident of a type different from any previously evaluated in the TMI DSAR.

The installation of the non-internet connected Wi-Fi router has no adverse effect on existing structures, systems, and components (SSC). The equipment provides capability to view pertinent information of the crane from outside the cab, and toggle select functions on the HMI.

**Summary of Conclusion for the Activity’s 50.59 Review:**

This Activity scope can be implemented without prior NRC approval.

For Scope Item 1, The Activity changes the way in which a previous 50.59 Evaluation response to prevent an accident of a type different from any previously evaluated in the DSAR is performed or controlled and therefore a 50.59 Evaluation is required. The 50.59 Evaluation determined that the use of RZ Mode operation of MIS-A-2B with the AFHT as implemented through the revision of procedure 1507-15 does not create an accident of a type different from any previously evaluated in the TMI DSAR. All Evaluation questions are answered "NO" for this scope.

For Scope Item 2, the 50.59 Screening determined that installation of the non-internet connected Wi-Fi router does not adversely affect any DSAR described design function nor how it is performed or controlled. This change does not involve an evaluation nor tests or experiments not described in the DSAR. All Screening questions are answered "NO" for this scope.

As concluded in this 50.59 Review, this Activity does not require a change to the Technical Specifications or Facility License.

Attachment 2

2020-2021 Biennial TMI-1 72.48 Summary Report

**Title:** Structural Evaluation of CC6 Vertical Concrete Cask / TMI MAGNASTOR CC6 VCC Tip-Over Analysis

**Year Implemented:** 2021

**Evaluation Number:** TMI-72.48-001.3B

**Description of Activity:**

Authorize use and issuance of TMI specific MAGNASTOR cask structural calculations as listed above in support of the 72.212 Evaluation Report for implementation and operation of the MAGNASTOR system at TMI-1.

**Reason for Activity:**

The applicable MAGNASTOR cask design for TMI-1 is the CC6 type. MAGNASTOR FSAR Chapter 3 describes structural analyses which demonstrate the CC6 cask design (among others) meets the required structural requirements for design basis normal conditions, and off-normal and accident events. The two calculations represented by this activity include analysis of (1 via 30076-2020) lower initial and aged cask concrete compressive strength values which differ from those evaluated in the MAGNASTOR FSAR, and (2 via 30076-2035) a hypothetical cask tip-over event using TMI-specific pad and soil parameters which differ from the MAGNASTOR generic parameters. These TMI-specific cases are not part of the structural evaluation presented in the MAGNASTOR Final Safety Analysis Report (FSAR) which has been approved by the NRC; however, they do support the TMI 72.212 report and the 72.48 review process is thus applicable.

**Effect of Activity:**

The proposed activity provides design bases to support the 72.212 Evaluation Report and implementation of the MAGNASTOR system. The following analyses are included in these calculations (as labeled) and are applicable to the 72.48 review process since they are not presented in the MAGNASTOR FSAR, which has been approved by the NRC.

From calculation 30076-2020:

(1a) Appendix I of NAC Calculation 30076-2020 documents the evaluations of CC6 for the normal, off-normal, and accident conditions of storage using a compressive strength of 13,200 psi (increased from 8,000 psi considered in the FSAR) to assess the effects of aged concrete strength.

(1b) Appendix J of NAC Calculation 30076-2020 documents the evaluations of CC6 for the normal, off-normal, and accident conditions of storage using a compressive strength of 6,000 psi (reduced from 8,000 psi considered in the FSAR) to assess the effects of low concrete strength to address nonconformance conditions during construction.

Note: Appendix K documents an evaluation which is not required to support the 72.212 Evaluation Report and is therefore not subject to review under 72.48.

From calculation 30076-2035:

(2a) Tip-over analyses in the main body of 30076-2035 using the TMI site specific cask, pad and soil parameters

(2b) Tip-over analyses in Appendix E of 30076-2035 using concrete properties for the pad and cask with increased compressive strength (67% increase to account for the effects of concrete aging).

The design functions of the MAGNASTOR concrete cask are to provide structural protection, radiation shielding, and internal airflow paths that remove the decay heat from the Transportable Storage Canister (TSC) surface by natural air circulation. The TSC provides the confinement boundary for the stored fuel. The concrete cask also provides protection during storage for the TSC against adverse environmental conditions.

For Items '1a' and '1b', the evaluation of the CC6 cask type is performed for the lift and storage conditions using concrete compressive strength of 13,200 psi (aged concrete strength) and 6,000 psi (low concrete strength), respectively, which differs from the CC6 cask concrete compressive strength of 8,000 psi used in MAGNASTOR FSAR Section 3.11. The evaluation results show the concrete cask meet the stress requirements of ACI 349-85 as described in the MAGNASTOR FSAR (as updated). However, since certain calculated factors of safety for the concrete cask evaluations are less than those presented in the concrete cask evaluation as documented in MAGNASTOR FSAR Section 3.11, the evaluations in Items '1a' and '1b' are considered to have an adverse effect of the design function of the MAGNASTOR system and requires 72.48 Evaluation.

For Items '2a' and '2b', the hypothetical tip-over event evaluations are performed using the TMI site specific cask, pad and soil parameters and using concrete properties for the pad and cask with increased compressive strength (67% increase from those used in the main body analyses to account for the effects of concrete aging). The analysis results show that the calculated g-loads at top of the fuel basket and top of the TSC lid are below the MAGNASTOR FSAR design g-loads of 35g and 40g, respectively, for side impact loading used in the structural evaluation of the fuel basket and TSC lid for accident events as presented in MAGNASTOR FSAR Section 3.7. However, the calculated g-loads from the calculation are slightly higher than those presented in MAGNASTOR FSAR Section 3.7.3.7 and as such are considered to have an adverse effect of the design function of the MAGNASTOR system and requires 72.48 Evaluation.

**Summary of Conclusion for the Activity’s 72.48 Review:**

NAC calculations 30076-3020 and 30076-2035 perform structural analyses which demonstrate the CC6 cask design meets the required MAGNASTOR FSAR structural requirements for design basis normal conditions, and off-normal and accident events. This 72.48 Evaluation has been performed for the proposed activity’s adverse effects related to (1a / 1b) lower initial and aged cask concrete compressive strength values which differ from those evaluated in the MAGNASTOR FSAR (1a / 1b) and a hypothetical cask tip-over event using TMI-specific pad and soil parameters (2a / 2b). The results of these analyses demonstrate that CC6 cask meets the stress requirements of ACI 349-85 and that the calculated tip-over g-loads are below the MAGNASTOR FSAR design g-loads, respectively. Therefore, the CC6 design functions are

maintained to satisfy the MAGNASTOR FSAR requirements and TMI 72.212 Evaluation Report.

As concluded in this 72.48 Review, there is no impact on MAGNASTOR FSAR described Independent Spent Fuel Storage Installation (ISFSI) operations, design bases or safety analyses, and therefore there is no impact on the Certificate of Compliance (CoC), Technical Specifications, or the 72.212 report. The Evaluation determined the proposed activity is allowed without prior NRC approval.

**Title:** TMI Site Dose Rate Analysis

**Year Implemented:** 2021

**Evaluation Number:** TMI-72.48-001.3B

**Description of Activity:**

Authorize use and issuance of TMI specific MAGNASTOR calculation listed above in support of the 72.212 Evaluation Report for implementation and operation of the MAGNASTOR system at TMI-1.

**Reason for Activity:**

The proposed activity is required to estimate the distances from the center of the TMI-1 ISFSI cask array of 46 MAGNASTOR spent fuel casks required to meet the 10 CFR 72.104(a) dose limit of 25 mrem/yr at the controlled area boundary (and for the nearest resident) per MAGNASTOR CoC Appendix A, Paragraph 5.5.3. The calculation represented by this activity includes analysis of the TMI ISFSI 4x13 cask array and site-specific controlled area boundary as well as nearest resident. These TMI-specific cases support the TMI 72.212 Evaluation Report and the 72.48 review process is thus applicable.

**Effect of Activity:**

The proposed activity provides design bases to support the 72.212 Evaluation Report and implementation of the MAGNASTOR system. The following analyses are included in these calculations (as labeled) and are applicable to the 72.48 review process since they are not presented in the MAGNASTOR FSAR, which has been approved by the NRC.

The design functions of the MAGNASTOR Transfer Cask (MTC) and concrete cask (CC6) include providing radiation shielding. MAGNASTOR FSAR Section 5.8.3.5 presents site boundary dose rates for a 2x10 cask array of 40 kW PWR concrete casks with a 1.75-inch thick steel liner. The TMI site-specific configuration is a 4x13 cask array with 46 CC6 type casks.

(1) As developed in the calculation, the distance measured from the center of the cask array to the 25 mrem/yr ‘boundary’ on the short side or 4-cask face of the TMI array is about 435 meters, while the distance to the 'boundary' on the 2-cask face of the FSAR array is about 400 meters. The distance to the boundary (from the center of the cask array) on the long side or 13-cask face of the TMI array is about 460 meters which is within the 465 meters for the 'boundary' of the MAGNASTOR FSAR evaluation. Although the actual site boundary distances are all greater than those computed in the calculation and the dose at the site boundary is within the regulatory requirements, in the context of site boundary dose rate analysis the increase in the distance to the 25 mrem/year dose limit 'boundary' for the short side is considered an adverse effect and requires 72.48 Evaluation.

MAGNASTOR FSAR Section 5.5 describes that the transfer cask and concrete cask are evaluated using the MCNP three-dimensional Monte Carlo code to estimate the dose profiles at the cask surface and at distances of 1ft, 1m, 2m, and 4m from the cask surface. MAGNASTOR Section 5.6.1.2 describes that the NAC version of the SKYSHINE-III code,

referred to as NAC-CASC, is used to evaluate the distance of the 25 mrem/year dose limit 'boundary' for an array of casks.

(2) The proposed activity uses MCNP as a revision to the Method of Evaluation (MOE) for the site boundary evaluation because it replaces the use of NAC-CASC for the far-field dose rate analysis and instead relies on MCNP for all dose rate analysis. The results of the calculation satisfy the 10 CFR 72.104(a) dose limit of 25 mrem/yr at the controlled area boundary (and for the nearest resident). NAC has demonstrated via benchmarking captured in calculation 71160-5903, "Comparison of MCNP and NAC-CASC for Skyshine Dose Rates," that solely using MCNP results in conservative or essentially the same dose rate results against the MAGNASTOR FSAR analysis. However, the use of a revised MOE is considered an adverse effect and requires 72.48 Evaluation.

**Summary of Conclusion for the Activity's 72.48 Review:**

NAC calculation 30076-5003 performs dose rate analyses which demonstrate the MTC and CC6 design meets the 10 CFR 72.104(a) dose limit of 25 mrem/yr at the controlled area boundary (and for the nearest resident). This 72.48 Evaluation has been performed for the proposed activity's adverse effects related to: (1) increase in the distance to the 25 mrem/year dose limit 'boundary' for the cask array short side, and (2) use of MCNP as a revision to the MAGNASTOR FSAR MOE for far-field dose rate analysis. The calculation results satisfy the regulatory requirements for dose rates per 10 CFR 72.104(a).

As concluded in this 72.48 Review, there is no impact on MAGNASTOR FSAR described ISFSI operations, design bases or safety analyses and, therefore, there is no impact on the CoC, Technical Specifications, or the 72.212 report. The Evaluation determined the proposed activity is allowed without prior NRC approval.

**Title:** TMI MAGNASTOR Transfer Cask Steady State Thermal Evaluation / TMI Transfer Cask and PWR Canister Transient Analysis / Structural Evaluation of Canister for 150-psig Off-normal Internal Pressure for Air Transfer Condition

**Year Implemented:** 2021

**Evaluation Number:** TMI-72.48-001.4B

**Description of Activity:**

Authorize use and issuance of TMI specific MAGNASTOR thermal/structural calculations as listed above in support of contingency procedures required for implementation and operation of the MAGNASTOR system at TMI-1.

**Reason for Activity:**

MAGNASTOR FSAR Section 4.11 describes thermal analysis performed for B&W 15 X 15 Array Fuel assemblies transferred in the stainless steel MTC and stored in type CC6 concrete casks, which is the applicable configuration for TMI-1. NAC calculations 30076-3005, 30076-3010 and 30076-2042 perform thermal and structural analyses, respectively, for off-normal / contingency conditions. Cases presented in these calculations reflect off-normal TSC transfer operations and contingency configurations not presented in the MAGNASTOR FSAR, which has been approved by the NRC, for which the 72.48 review process is applicable.

Analyses of these TMI-specific cases is applied to the FSAR cases, and support TMI / MAGNASTOR operation contingency procedures.

**Effect of Activity:**

The proposed activity provides design bases for contingency procedures that may be used during MAGNASTOR operations. The following analyses are included in these calculations (as labeled) and are applicable to the 72.48 review process since they are not presented in the MAGNASTOR FSAR, which has been approved by the NRC.

Transfer condition thermal analyses, including related maximum temperatures, are given in MAGNASTOR FSAR Section 4.11. Transfer conditions include four operational phases associated with loading, processing, and transferring the canister into the storage overpack: (1) the water phase, (2) vacuum drying phase, (3) cooling/helium phase, and (4) air transfer phase.

(a) Thermal analyses for transfer conditions using R-ACWS (Downflow) - alternate to normal Auxiliary Circulating Water System (ACWS) (or up-flow):

- R-ACWS with 70°F water temperature and a flow rate of 40 GPM (Appendix E of 30076-3005).
- R-ACWS with 100°F water temperature and a flow rate of 60 GPM (Appendix F of 30076-3005, Appendices K, L and N of 30076-3010) Note that this is the bounding case.

(b) Thermal analyses for thermal contingency events:

- Transient analysis for water phase without ACWS (Appendix G of 30076-3005)
- Transient analyses for 4.5 hours of ACWS Loss during vacuum drying phase (Appendices

E, F, L, Q of 30076- 3010).
- Steady state analysis for air transfer phase with indefinite time (Appendix J of 30076-3010).
- Thermal analyses for TSC backfilled with Nitrogen (Appendices H, I of 30076-3005 and Appendices M, P of 30076-3010).
- Transient analysis for additional cooling of TSC after transfer phase (Appendix S of 30076-3010).

(c) Structural analysis for 'air transfer with indefinite time' contingency event (30076-2042):

The R-ACWS used in the transfer conditions as described in Item 'a' provides a similar cooling function as the ACWS described in the MAGNASTOR FSAR Section 4.11 (as updated). The difference in the calculated maximum fuel temperatures for the transfer conditions is insignificant between the evaluations for ACWS (100°F water and 40 GPM) and R-ACWS (100°F water and 60 GPM). As discussed in Section K1 in Appendix K of 30076-3010, the difference is 2°F in the maximum fuel temperatures (maintaining a margin of approximately 130°F to the temperature limit of 752°F) for the bounding case for the vacuum drying phase. Therefore, the use of R-ACWS as an alternative for TSC cooling has an insignificant effect on the design function of the MTC.

The thermal analyses for the thermal contingency events for the transfer conditions described in Item 'b' indicate that the system component temperatures are within the allowable temperature limits. For the water phase without ACWS, the calculated maximum water temperature remains below the boiling temperature of water at 19 hours. Based on the thermal analyses for other thermal contingency events in Item 'b', the calculated maximum fuel cladding temperatures are higher than the maximum fuel cladding temperatures for the regular transfer conditions as presented in FSAR Section 4.11 (as updated) but remain well below the temperature limit of 752°F which supports the conclusion that the MTC cooling design function is maintained. However, the temperature increases for the thermal contingency events are considered an adverse effect to the design function of the MTC and requires 72.48 Evaluation.

Item 'c' presents a TSC evaluation for off-normal condition using a conservative internal pressure of 150 psig. This pressure is higher than the internal pressure of 130 psig used in the evaluation of the TSC evaluation for off- normal condition as described in FSAR Section 3.6.1 (as updated). This analysis results show that the calculated TSC stresses satisfy the stress criteria per ASME Code, Section III, Subsection NB as specified in FSAR Section.

3.1.3 (as updated) which support the conclusion that the TSC containment function is maintained. However, the calculated TSC stresses are higher than those presented in FSAR Section 3.6.1 and is considered an adverse effect to the design function of the TSC and requires 72.48 Evaluation.

**Summary of Conclusion for the Activity’s 72.48 Review:**

NAC calculations 30076-3005, 30076-3010 and 30076-2042 perform thermal and structural analyses, respectively, for off-normal / contingency conditions. This 72.48 Evaluation has been

performed for the proposed activity's adverse effects related to: (1) maximum fuel cladding temperature increases, and (2) TSC internal pressure increases. The results of these thermal analyses, including those for other off-normal/contingency cases, show that the maximum fuel cladding temperature remains well below the fuel thermal limit, and thus the design function of the MTC for TSC cooling is met. The associated TSC structural analysis for off-normal air transfer phase using internal TSC pressure of 150 psig shows TSC physical integrity is maintained per FSAR requirements.

As concluded in this 72.48 Review, there is no impact on MAGNASTOR FSAR described ISFSI operations, design bases or safety analyses, and therefore there is no impact on the CoC, Technical Specifications, or the 72.212 report. The Evaluation determined the proposed activity is allowed without prior NRC approval.