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10 CFR 50.54(f)

TMI-12-148
May 16, 2013

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: TMI, Unit 1 Plant-Specific Path and Schedule for Resolution of Generic Letter 2004-02

References:
(1) Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004

(2) SECY-12-0093: R. W. Borchardt, U.S. Nuclear Regulatory Commission, to The Commissioners, U.S. Nuclear Regulatory Commission, "Closure Options for Generic Safety Issue - 191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance," dated July 9, 2012

Generic Safety Issue - 191 Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance concluded that debris could clog the containment sump strainers in pressurized water reactors (PWRs), leading to the loss of net positive suction head for the emergency core cooling system (ECCS) and containment spray system (CSS) pumps. The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors", dated September 13, 2004, (Reference 1) requesting that licensees address the issues raised by GSI-191. GL 2004-02 was focused on demonstrating compliance with 10 CFR 50.46.

Since the issuance of GL 2004-02, the industry, through extensive testing and modifications, has made large investments in understanding and mitigating the effects of post-LOCA debris generation, debris transport, sump screen effectiveness, and, most recently, in-vessel effects of the debris that could bypass the sump screens.

On July 9, 2012 the NRC staff issued SECY-12-0093, "Closure Options for Generic Safety Issue - 191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance" (Reference 2). SECY-12-0093 presents three options to the Commission; each considered a viable path for resolving GSI-191. The options identified in the SECY provide approaches that can be used to address plants with minimal fibrous insulation, low to medium fibrous insulation, and substantial amounts of fibrous insulation. Although a licensee may choose to pursue any option to achieve closure, specific options may lend themselves optimally to a plant's fiber status.

By letter dated November 21, 2012, from W. H. Ruland (NRC) to J. C. Butler (NEI), titled "Nuclear Regulatory Commission Review of Generic Safety Issue-191 Nuclear Energy Institute Revised Schedule for Licensee Submittal of Resolution Path," the NRC extended the date for the GSI-191 submittal. The revised schedule permits the licensee to submit their chosen resolution option and associated resolution implementation schedule to the NRC, 30 days following the NRC making the final safety evaluation associated with the review of WCAP-16793, Revision 2, and the Staff Safety Requirements Memorandum associated with SECY-12-0093 publicly available. These documents were made publicly available April 16, 2013; therefore, the revised submittal date is May 16, 2013.

Attachment 1 to this letter provides the Three Mile Island, Unit 1 (TMI, Unit 1) plant-specific path and schedule for resolution of GSI-191. Attachment 2 provides a summary of the regulatory commitments.

If you have any questions or require additional information, please contact Stephanie J. Hanson at (610) 765-5143.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 16th day of May 2013.

Respectfully,

R. W. Libra
Site Vice President, Three Mile Island, Unit 1
Exelon Generation Company, LLC

Attachments: 1. Three Mile Island, Unit 1, Plant-Specific Path and Schedule for Resolution of Generic Letter 2004-02
2. Regulatory Commitments

cc: USNRC Region I, Regional Administrator

USNRC Project Manager, TMI, Unit 1
USNRC Senior Resident Inspector, TMI, Unit 1
Director, Bureau of Radiation Protection, PA Department of Environmental Resources
Chairman, Board of County Commissioners, Dauphin County, PA
Chairman, Board of Supervisors, Londonderry Township, PA
R. R. Janati, Commonwealth of Pennsylvania

bcc: Sr. Vice President, Mid-Atlantic Operations
Site Vice President - TMI, Unit 1
Plant Manager - TMI, Unit 1
Director, Site Operations - TMI, Unit 1
Director, Site Engineering - TMI, Unit 1
Director, Site Maintenance - TMI, Unit 1
Director, Site Training – TMI, Unit 1
Director, Licensing & Regulatory Assurance - KSA
Manager, Regulatory Assurance - TMI, Unit 1
Manager, Licensing - KSA
Manager, Operations Support - TMI, Unit 1
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D. S. Hockley - TMI, Unit 1
C. A. Warlow - TMI, Unit 1
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ATTACHMENT 1

TMI, Unit 1 Plant-Specific Path and Schedule for Resolution of Generic Letter 2004-02

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

1.0 BACKGROUND

Generic Safety Issue - 191 Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance (GSI-191) concluded that debris could clog the containment sump strainers in pressurized water reactors (PWRs), leading to the loss of net positive suction head (NPSH) for the emergency core cooling system (ECCS) and containment spray system (CSS) pumps. The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004 (Reference 1), requesting that licensees address the issues raised by GSI-191. GL 2004-02 was focused on demonstrating compliance with 10 CFR 50.46.

On July 9, 2012 the NRC staff issued SECY-12-0093, "Closure Options for Generic Safety Issue - 191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance," (Reference 2) presenting three options to the Commission all of which are considered to be viable paths for resolving GSI-191. These options are:

Option 1 - Compliance with 10 CFR 50.46 Based on Approved Models,
Option 2 - Deterministic or Risk-informed, and
Option 3 - Different Regulatory Treatment for Suction Strainer and In-Vessel Effects

By letter dated November 21, 2012, from W. H. Ruland (NRC) to J. C. Butler (NEI), titled "Nuclear Regulatory Commission Review of Generic Safety Issue-191 Nuclear Energy Institute Revised Schedule for Licensee Submittal of Resolution Path," the NRC extended the date for the GSI-191 submittal. The revised schedule permits the licensee to submit their chosen resolution option and associated resolution implementation schedule to the NRC, 30 days following the NRC making the final safety evaluation associated with the review of WCAP-16793, Revision 2, and the Staff Safety Requirements Memorandum associated with SECY-12-0093 publicly available. These documents were made publicly available April 16, 2013; therefore, the revised submittal date is May 16, 2013.

2.0 SECY-12-0093 OPTIONS

The options identified in SECY-12-0093 provide approaches that can be used to address plants with minimal fibrous insulation, low to medium fibrous insulation, and substantial amounts of fibrous insulation. Although a licensee may choose to pursue any option to achieve closure, specific options may lend themselves optimally to a plant's fiber status.

Key aspects of each option are provided below.

2.1 Option 1: Compliance with 10 CFR 50.46 Based on Approved Models

Licensees choosing Option 1 will demonstrate compliance with 10 CFR 50.46 through approved deterministic models for analyses, strainer head loss testing, and in-vessel effects.

By selecting Option 1, licensees will need to demonstrate that they:

- Meet the "Clean Plant Criteria" issued by the NRC on May 2, 2012 (Reference 9), **or**
- Have sufficiently low strainer bypass, **and**
- Meet the 15 grams per fuel assembly limit that is expected to be endorsed by the NRC in their SE for WCAP-16793, Rev. 2, and any limitations and conditions in the SE.

Licensees that select Option 1 will be subject to operational limits based on the current deterministic limits. Additional margin may be achieved in the future through application of alternative in-vessel limits established through ongoing PWROG test and analysis efforts.

This option allows for the use of proposed approaches that will be reviewed in the near term (e.g., reduced zones of influence (ZOIs) and settling credit during strainer testing). The SECY notes that NRC will balance known conservatisms against potential non-conservatisms and uncertainties in licensees' analyses.

If additional plant actions are necessary to support Licensees selecting Option 1, these actions need to be completed within two refueling outages after January 1, 2013.

2.2 Option 2: Deterministic or Risk-Informed

Licensees choosing Option 2 will implement defense-in-depth measures to mitigate the residual risk from those issues that have not been resolved. Option 2 is a graded approach in which the licensee's actions, and the schedule for those actions, are based on the amount of fibrous insulation in the plant.

The SECY paper identifies two separate resolution paths under Option 2. Both paths call for mitigative measures to be established and implemented during the period of time in which alternative (new) resolution methods and acceptance criteria are established.

2.2.1 Option 2a: Deterministic Resolution Path

The deterministic path would allow a period defined by three refueling outages to complete testing supporting alternative methods and to complete necessary plant modifications. In parallel, the plant will evaluate the applicability of alternative resolution and acceptance criteria being developed by the new PWROG test and analysis program. It is anticipated that application of new in-vessel criteria will minimize or eliminate the need for additional plant modifications.

The resolution schedule associated with Option 2a is defined as a function of a plant's refueling schedule. For plants with relatively high fiber content, measurements for possible insulation replacement must be completed by the end of the first refueling outage following January 1, 2013.

2.2.2 Option 2b: Full Risk-Informed Resolution Path

The risk-informed path would allow plants to utilize risk-informed resolution methods that are currently being piloted by South Texas Project (STP). Plants choosing this option will be required to develop risk assessment models and perform plant-specific testing necessary to justify major assumptions. A plant specific resolution schedule would be established in discussion with NRC but would generally call for submittal of a risk-informed licensing action by December 2015 and implementation of any necessary changes during the first refueling outage following NRC acceptance.

In order to implement Option 2b, plants will participate in periodic pre-application meetings with the NRC. Licensees will submit their risk-informed analyses 6 months to 1 year following the issuance of the NRC SE for STP, which is projected to be completed by December 2014.

Within two refueling outages after January 1, 2013, all testing to support assumptions must be completed to provide evidence of whether this approach will be successful. All required modifications are to be completed within one refueling outage following an NRC decision (SE). If testing demonstrates that a risk-informed approach is not feasible, a deterministic resolution path must be completed by the third outage after January 1, 2013.

2.3 Option 3: Different Regulatory Treatment for Suction Strainer and In-Vessel Effects (Deterministic for Strainer Head Loss /Risk-Based for In-Vessel Effects Resolution Path)

Licensees choosing Option 3 will use a deterministic approach, similar to Option 1, to resolve the strainer issue and a risk-informed approach to resolve the in-vessel effects. To support the deterministic approach to the strainer issue, licensees of either high fiber or low to medium fiber plants would identify and implement defense-in-depth measures to mitigate the residual risk from those issues that have not been resolved, while testing, analysis, and modifications to resolve GSI-191 are being completed. These measures can be a combination of those currently in place and those that will be put in place. To support the risk-informed approach to resolve the in-vessel effects, a Regulatory Guide 1.174 evaluation of the risk for in-vessel blockage may be required to demonstrate that the risk is sufficiently small to support an exemption from 10 CFR 50.46. This resolution path could include items such as reduced time to hot-leg switchover, timing of the onset of chemical effects, detection and mitigation methods for in-vessel blockage, etc.

Option 3 requires completion of the deterministic evaluation by two refueling outages after January 1, 2013, and completion of the risk-informed approach consistent with the schedule associated with Option 2b.

This option is only conceptually defined at this point. The NRC is interested in identifying a plant or group of plants to pilot this approach and develop industry guidance.

3.0 TMI, UNIT 1 PLANT-SPECIFIC PATH: SECY-12-0093 OPTION 2a

Exelon Generation Company, LLC (EGC) has selected Option 2a for the Three Mile Island Nuclear Station, Unit 1 (TMI, Unit 1) and intends to complete additional plant modifications and pursue refinements to evaluation methods and acceptance criteria. To support use of this option, and continued operation for the period required to complete the necessary modifications and testing, EGC has evaluated the design and procedural capabilities that exist to detect and mitigate sump strainer and in-vessel blockage. A description of these detection and mitigation measures is provided in Section 8.0 below. Additionally, a summary of the existing margins and conservatisms that exist for TMI, Unit 1 are provided in Section 7.0 below.

3.1 Characterization of Current Containment Fiber Status

From the current debris generation and debris transport analysis, TMI, Unit 1 has determined that the amount of fibrous debris that could be transported to the strainers will require reduction in order to provide strainer head loss margin and/or to meet future fiber bypass parameters that are currently under development. To reduce the amount of fibrous debris in containment, TMI, Unit 1 will replace the NUKON insulation currently installed on the pressurizer with Reflective Metallic Insulation (RMI). TMI, Unit 1 previously performed strainer head loss testing (Reference 3) but intends to re-perform the testing for the modified plant configuration. The results of this testing will then establish a conservative quantity of fiber that could be transported

to the strainers and the reactor fuel.

The largest sources of fibrous debris (NUKON and Thermal-Wrap) for TMI, Unit 1 are located in the "A" D-ring. During the TMI, Unit 1 2009 refueling outage (T1R18), both steam generators were replaced. As part of that effort, the NUKON insulation on the steam generators and hot leg piping was replaced with Reflective Metal Insulation (RMI). This resulted in a reduction in the quantity of NUKON and Thermal-Wrap insulation in the "A" D-ring, from 682 ft^3 to 523 ft^3 (both of these values include 60 ft^3 of NUKON added as margin). Replacing the pressurizer NUKON insulation with RMI will result in removal of an additional 454 ft^3 of NUKON insulation. The remaining sources of fibrous debris in the "A" D-Ring are the pressurizer spray line and spray line bypass, pressurizer surge line, and on the pressurizer relief valves (Reference 8).

There are approximately 5 ft^3 of NUKON insulation remaining in the "B" D-Ring following Once Through Steam Generator (OTSG) replacement. The Debris Generation analysis currently includes 60 ft^3 of NUKON added as margin for the "B" D-Ring.

The TMI, Unit 1 Debris Generation analysis assumes that 15% of the containment latent debris is fibrous material. A latent debris load of 300 lbs was assumed in the analysis. Therefore, 45 lbs of latent fiber was included in the strainer debris load (Reference 3). The initial latent debris survey, which was performed during the T1R16 refueling outage in 2005, determined the amount of latent debris in containment to be approximately 193 lbs. Subsequently, during the T1R19 refueling outage in 2011, a second survey was conducted and determined the amount of latent debris in containment to be 134 lbs.

TMI, Unit 1 did not perform a site specific strainer debris bypass test. The bypass results from a test performed for another licensee were determined to conservatively bound the bypass quantity for the TMI, Unit 1 strainer design. The bypass fraction was determined to be 5.2 lbm/1000 square foot of strainer surface area. For the TMI, Unit 1 strainer surface area of 2580 square feet (Reference 3), the total strainer bypass is 13.4 lb. This bypass total results in a fiber debris load of 34.3 grams per fuel assembly for the TMI, Unit 1 core design of 177 fuel assemblies.

3.2 Characterization of Strainer Head Loss Status

TMI, Unit 1 had previously provided the results of strainer head loss testing, including the impact of chemical effects; this information including related NRC RAIs are contained in References 3 through 8. This testing demonstrated acceptable results with regard to allowable head loss, albeit with small NPSH margin. However, TMI, Unit 1 has determined that the amount of fibrous debris that could be transported to the strainers will require reduction in order to provide strainer head loss margin and to meet future fiber bypass parameters that are currently under development. TMI, Unit 1 intends to re-perform strainer head loss testing based on lessons learned with regard to strainer testing methodology including determination of chemical effects impact (production, time-dependency, etc.) to improve the margin associated with this aspect of GL 2004-02.

3.3 Characterization of In-Vessel Effects

EGC intends to follow the resolution strategy proposed by the PWROG for establishing in-vessel debris limits for the type of plant design that exists at TMI, Unit 1.

As part of the effort to replace the NUKON insulation on the pressurizer, TMI, Unit 1 will re-

evaluate the strainer debris bypass. This would include a review of available information for the Enercon top hat design strainer with a Debris Bypass Eliminator installed and/or performance of a site-specific debris bypass test.

4.0 TMI, UNIT 1 PLANT-SPECIFIC RESOLUTION SCHEDULE

TMI, Unit 1 will achieve closure of GSI-191 and address GL 2004-02 per the following schedule:

- TMI, Unit 1 will replace the NUKON insulation currently installed on the pressurizer with Reflective Metallic Insulation (RMI) in the fall 2015 refueling outage (T1R21).

- TMI, Unit 1 will complete strainer head loss testing based on the reduced debris load by December 31, 2015.

- TMI, Unit 1 will re-evaluate the strainer debris bypass. This would include a review of available information for the Enercon top hat design strainer with a Debris Bypass Eliminator installed and/or performance of a site-specific debris bypass test by July 31, 2016.

- EGC will submit a final updated supplemental response to support closure of GL 2004-02 for TMI, Unit 1 by June 1, 2017.

- EGC will update the current licensing basis following NRC acceptance of the updated supplemental response for TMI, Unit 1 and completion of the identified removal or modification of insulation debris sources in containment.

5.0 TMI, UNIT 1 COMMITMENTS

By letter dated, November 10, 2008, EGC made a commitment to report to the NRC how TMI, Unit 1 has addressed the in-vessel downstream effects issue within 90 days of issuance of the final NRC staff SE on WCAP-16793 (Reference 5). Additionally, on November 9, 2009 (Reference 8), EGC made a commitment that states within 90 days of issuance of the final NRC decision on the acceptability of WCAP-16710-P, and its related supplemental information, TMI, Unit 1 will report how it has addressed the set of ten questions titled "Issues Generic to Westinghouse Debris Generation Testing" issued in the NRC RAI dated July 23, 2009 (Reference 7). As a result of the remaining open questions associated with GL 2004-02 for TMI, Unit 1, and the information contained within this document, the previously established commitments are considered to be closed based on the intended direction to be taken as described in this document.

New commitments as a result of this document are described in Attachment 2. These new commitments will support closure of GL 2004-02 for TMI, Unit 1.

6.0 TMI, UNIT 1 SUMMARY OF ACTIONS COMPLETED TO ADDRESS GL 2004-02

To support closure of GSI-191 and to address GL 2004-02, EGC has completed the following actions for TMI, Unit 1:

- Replaced the original sump strainer with a simple geometry that had a filtering surface area of 224 ft^2, with nominal 1/8 in square openings with complex geometry strainers

having a filtering surface area of 2580 ft^2, with nominal 3/32 in circular openings. The sump strainer replacement was performed in the TMI, Unit 1, 2007 refueling outage (T1R17). The annular region of the strainer top hat modules contains a Debris Bypass Eliminator (wire mesh filter element) to minimize the amount of debris that gets through the strainer (Reference 3).

- TMI, Unit 1 replaced the sodium hydroxide pH buffer with tri-sodium phosphate to reduce the chemical effects impacts on strainer blockage (Reference 3).

- A trash rack was installed over the top of the fuel transfer canal drain line to provide additional assurance that the drain line would not become clogged with debris (Reference 5).

- As part of the steam generator replacement project, the NUKON insulation on the steam generators and Reactor Coolant System (RCS) hot leg piping was replaced with Reflective Metal Insulation (RMI) in 2009 during T1R18. Approximately 160 ft^3 of NUKON insulation was removed from the "A" D-Ring and approximately 130 ft^3 was removed from the "B" D-Ring (Reference 8).

- An initial latent debris survey was performed in 2005 to determine the amount of latent debris in containment. A second survey was conducted in 2011. The results of both surveys which are 193 lbs in 2005 and 134 lbs in 2011 determined the amount of latent debris in containment to be less than the 300 lbs assumed in the debris analyses (Reference 3). A repetitive task has been established to perform the latent debris survey every third refueling outage (i.e., 6 years for TMI, Unit 1).

- TMI, Unit 1 completed debris generation, debris transport, ex-vessel downstream effect, and ECCS pump NPSH analyses as described in References 3, 5, 6, and 8. These analyses will be revised if needed as part of the modifications to replace NUKON insulation on the pressurizer.

- TMI, Unit 1 Emergency Operating Procedures (EOPs) were revised as follows (Reference 3):

  1. A step was added to the EOP for Reactor Building (RB) sump recirculation to ensure that Building Spray (BS) is shut down consistent with the limits assumed in the analysis.

  2. EOP guidance for throttling Low Pressure Injection (LPI) flow was revised based on Control Room indication of high strainer differential pressure.

- A repetitive task has been established to inspect coatings inside containment every refueling outage and update the RB containment coating inventory calculation after completing the inspection. This task ensures that the condition of coatings within the RB remains within the bounds of the GSI-191 analyses.

- Procedure changes were made so that the RB is controlled as a Foreign Material Exclusion (FME) Area during planned containment entries to prevent the introduction of additional sources of debris.

7.0 TMI, UNIT 1 SUMMARY OF MARGINS AND CONSERVATISMS FOR COMPLETED ACTIONS FOR GL 2004-02

The following provides a summary description of the margins and conservatisms associated with the resolution actions taken to date. These margins and conservatisms provide support for the extension of time required to address GL 2004-02 for TMI, Unit 1.

- The TMI, Unit 1 NPSH analysis conservatively applies the full debris load at the start of recirculation. In an actual event, several pool turnovers would be required before the full debris load would be transported to the strainer. The TMI, Unit 1 containment pool contains approximately 231,000 gallons (30,908 ft^3) at minimum level. At the maximum recirculation flow rate of 8582 gpm, it would take approximately 27 minutes for one pool turnover to occur. Delay in the build up of debris on the strainer provides additional time for sump temperatures to decrease which is beneficial for pump NPSH (Reference 8).

- The minimum containment water level is used to determine available ECCS pump NPSH using the following assumptions (Reference 3):

    1. The LOCA is assumed to occur at the highest elevation in the Reactor Coolant System (RCS) resulting in the maximum amount of coolant being retained in the RCS.

    2. Both BS loops are assumed to be in operation at the time of initiation of recirculation mode resulting in the maximum amount of water being held up in the Fuel Transfer Canal (FTC) and RB floors.

    3. The Core Flood Tank (CFT) and BWST are each assumed to be at their maximum operating temperatures which represent the smallest mass of water to be injected.

    4. Minimum water volumes are assumed to be injected from the CFTs and BWST.

- As part of the steam generator replacement project, the NUKON insulation on the steam generators and Reactor Coolant System (RCS) hot leg piping was replaced with Reflective Metal Insulation (RMI). Approximately 160 ft^3 of NUKON insulation was removed from the "A" D-Ring and approximately 130 ft^3 was removed from the "B" D-Ring. (Reference 8)

Listed below are the conservatisms which TMI, Unit 1 incorporated into the previously completed analyses and testing as identified in Reference 5:

1. TMI, Unit 1 utilizes a bounded debris loading strategy for testing inputs. The debris load utilized is a combination of the bounding fiber loads from the East D-Ring break and the bounding particulate loads from the West D-Ring break.

2. TMI, Unit 1 utilizes a latent debris load of 300 lbs versus the 2005 walkdown determined value of 193 lbs. A subsequent walkdown in 2011 determined the latent debris load to be 134 lbs.

3. TMI, Unit 1 utilizes a tags and labels loading of 400 ft^2 versus a walkdown determined value of 332.3 ft^2.

4. The TMI, Unit 1 minimum 15" submergence of the top hat modules at minimum credited water level is greater than that used in the testing. Testing was conducted at an initial submergence of approximately 6" above the top hat modules at prototypical plant conditions, and no vortexing was observed for the postulated operating conditions of the TMI, Unit 1 sump strainer design.

As described in this submittal, TMI, Unit 1 will perform additional modifications to reduce the amount of fibrous debris that could be transported to the strainer to improve the strainer head loss margins.

8.0 TMI, UNIT 1 SUMMARY OF DEFENSE-IN-DEPTH (DID) MEASURES

The following describes the plant specific design features and procedural capabilities that exist for detecting and mitigating a strainer blockage or fuel blockage condition. Although these measures are not expected to be required based on the very low probability of an event that would challenge either the capability of the strainer to provide the necessary flow to the ECC and BS Systems, or result in significant quantities of debris being transported to the reactor vessel that would inhibit the necessary cooling of the fuel, they do provide additional assurance that the health and safety of the public would be maintained. These measures provide support for the extension of time required to completely address GL 2004-02 for TMI, Unit 1.

8.1 OPERATING PROCEDURE CAPABILITIES

- Low Pressure Injection (LPI) flow is throttled to less than or equal to 3300 gpm when LPI is initiated. Procedures identify this as a time critical action. Throttling promptly provides more time before the Borated Water Storage Tank (BWST) is emptied and Reactor Building (RB) sump recirculation is required.

- The maximum available water volume is transferred from the BWST before transitioning to RB sump recirculation. The volume of water injected into the RB directly impacts the available NPSH for the ECCS pumps.

- One train of RB spray is secured following initiation of sump recirculation. The second train of RB spray is secured when building spray operating time is approaching 24 hours. These actions reduce recirculation flow which reduces debris transport and differential pressure across the strainer.

- If there is indication of high differential pressure across the RB sump strainer, LPI flow will be throttled to less than or equal to 1500 gpm in each line. High differential pressure can be identified by comparing control room indication of ECCS sump level versus the RB flood level instruments, as discussed in the Design Features Section, below. This action reduces recirculation flow which reduces debris transport and differential pressure across the strainer.
- After initiating sump recirculation, operating procedures direct that action be initiated to refill the BWST. Operating procedures identify six (6) possible sources of water for refilling the BWST, which are the Spent Fuel (SF) Pool, Reactor Coolant Bleed Tank (RCBT), Fire Service, Emergency Feedwater (EFW), ECCS Sump, and Auxiliary Building Sump.

- If there is indication of LPI pump cavitation as evidenced by fluctuations in flow, amps, or

discharge pressure, or increased vibrations, operating procedures direct that LPI flow will be throttled to a minimum value and the BS pumps will be shut down.

8.2 SUPPORT PROCEDURE CAPABILITIES

- A Technical Support Center guideline is in place for reinitiating injection from the BWST (TSC Guideline for Managing BWST Inventory). This procedure provides instructions/methods for initial LPI throttling, re-initiation of flow from the BWST, and an alternate method of cooling if BWST inventory cannot be maintained.

8.3 DESIGN FEATURES

- The installed ECCS sump and RB flood level instrumentation provides an indication of differential pressure across the strainer to the Control Room Operators. The ECCS sump level instruments measure the water pressure below the ECCS strainer. A strainer differential pressure of greater than 7.5 ft-H2O will cause ECCS sump level to indicate less than RB flood level indication. Procedure guidance is provided to throttle flow based on indication of high strainer differential pressure as described in the Procedural Capabilities Section (Reference 3).

- The pressurizer is the largest single source of fibrous debris for TMI, Unit 1. The pressurizer is partially shielded from hot and cold leg breaks by the reactor coolant pump and motor and by the pressurizer support ring. The support ring is fabricated from 30" tall structural beams and completely surrounds the pressurizer just above the heater bundles. These components aid in minimizing the damage to the NUKON insulation on the pressurizer.

- Large permanent platforms (grating) are installed near the bottom and top of the pressurizer. Although not credited in the debris transport analysis, these platforms aid in minimizing the amount of NUKON insulation that is transported to the floor and subsequently to the sump strainer.

9.0 CONCLUSION

EGC expects that the GSI-191 resolution path for TMI, Unit 1 is acceptable, based on the information provided in this document. The execution of the actions identified in this document will result in successful resolution of GSI-191 and closure of GL 2004-02.

10.0 REFERENCES

1. NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004.

2. SECY-12-0093: R.W. Borchardt, U.S. Nuclear Regulatory Commission, to The Commissioners, U.S. Nuclear Regulatory Commission, "Closure Options for Generic Safety Issue – 191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance," dated July 9, 2012.

3. Three Mile Island Unit 1 Supplemental Response to NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," dated December 28, 2007.

4. Letter from P. Bamford (U.S. Nuclear Regulatory Commission) to C. G. Pardee (AmerGen Energy Company, LLC), "Three Mile Island Nuclear Power Station, Unit 1 – Request for Additional Information Related to Generic Letter 2004-02," dated August 12, 2008.

5. Letter from P.B. Cowan (Exelon Generation Company, LLC and AmerGen Energy Company, LLC) to U. S. Nuclear Regulatory Commission, "Three Mile Island, Unit 1 Response to Request for Additional Information Related to NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated November 10, 2008.

6. Letter from P. B. Cowan (Exelon Generation Company, LLC and AmerGen Energy Company, LLC) to U. S. Nuclear Regulatory Commission, "Supplemental Information to the Three Mile Island, Unit 1 Supplemental Response to NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors"," dated February 12, 2009.

7. Letter from P. Bamford (U.S. Nuclear Regulatory Commission) to C. Pardee (Exelon Generation Company, LLC), "Three Mile Island Nuclear Station, Unit 1 – Request for Additional Information Regarding Generic Letter 2004-02, Supplemental Response," dated July 23, 2009 (TAC No. MC4724).

8. Letter from P. B. Cowan (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "Response to Request for Additional Information Regarding Generic Letter 2004-02," dated November 9, 2009.

9. Letter from W. H. Ruland (U.S. Nuclear Regulatory Commission) to J. C. Butler (Nuclear Energy Institute), "NRC Review of Nuclear Energy Institute Clean Plant Acceptance Criteria for Emergency Core Cooling Systems," dated May 2, 2012 (ML 120730181).

ATTACHMENT 2

Regulatory Commitments

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

Summary of Regulatory Commitments

The following table identifies those actions committed to by Exelon Generation Company, LLC (EGC) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	PROGRAMMATIC (Yes/No)
Replace the NUKON insulation currently installed on the pressurizer with Reflective Metallic Insulation (RMI) for TMI, Unit 1.	T1R21 (Fall 2015)	Yes	No
Complete strainer head loss testing based on the reduced debris load for TMI, Unit 1.	December 31, 2015	Yes	No
Re-evaluate the strainer debris bypass for TMI, Unit 1. This would include a review of available information for the Enercon top hat design strainer with a Debris Bypass Eliminator installed and/or performance of a site-specific debris bypass test.	July 31, 2016	Yes	No
EGC will submit a final updated supplemental response to support closure of GL 2004-02 for TMI, Unit 1.	June 1, 2017	Yes	No