Exelon Generation.

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TMI-14-128

10 CFR 50.54(f)

December 17, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
11555 Rockville Pike,
Rockville. MD 20852

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

Subject: Exelon Generation Company, LLC Expedited Seismic Evaluation Process Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident

References:

1. NRC Letter, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012 (ML12053A340)
2. NEI Letter, Proposed Path Forward for NTTF Recommendation 2.1: Seismic Re-evaluations, dated April 9, 2013 (ML13101A379)
3. Seismic Evaluation Guidance: "Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1 – Seismic", EPRI, Palo Alto, CA: May 2013. 3002000704 (ML13102A142)
4. NRC Letter, Electric Power Research Institute Report 3002000704, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," as an Acceptable Alternative to the March 12, 2012, Information Request for Seismic Re-evaluations, dated May 7, 2013 (ML13106A331)
5. Exelon Generation Company, LLC, Seismic Hazard and Screening Report (Central and Eastern United States (CEUS) Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident (RS-14-073), dated March 31, 2014 (ML14090A271)
6. Exelon Generation Company, LLC Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident – 1.5 Year Response for CEUS Sites (RS-13-205), dated September 12, 2013 (ML13256A070)

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued a 50.54(f) letter to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 1 of Reference 1 requested each addressee located in the Central and Eastern United States (CEUS) to submit a Seismic Hazard Evaluation and Screening Report within 1.5 years from the date of Reference 1.

In Reference 2, the Nuclear Energy Institute (NEI) requested NRC agreement to delay submittal of the final CEUS Seismic Hazard Evaluation and Screening Reports so that an update to the Electric Power Research Institute (EPRI) ground motion attenuation model could be completed and used to develop that information. NEI proposed that descriptions of subsurface materials and properties and base case velocity profiles be submitted to the NRC by September 12, 2013, (Reference 6), with the remaining seismic hazard and screening information submitted by March 31, 2014 (Reference 5). NRC agreed with that proposed path forward in Reference 4.

Reference 1 requested that licensees provide interim evaluations and actions taken or planned to address the higher seismic hazard relative to the design basis, as appropriate, prior to completion of the risk evaluation. In accordance with the NRC endorsed guidance in Reference 3, the enclosed Expedited Seismic Evaluation Process (ESEP) Report for Three Mile Island Nuclear Station, Unit 1, provides the information described in the "ESEP Report" Section 7, of Reference 3 in accordance with the schedule identified in Reference 2.

All equipment evaluated for the ESEP for Three Mile Island Nuclear Station Unit 1 was found to have adequate capacity for the required seismic demand as defined by the Augmented Approach (ESEP) guidance (Reference 3). Therefore, no equipment modifications are required.

This ESEP report transmittal completes regulatory Commitment No. 3 of Reference 5.

No new regulatory commitments result from this transmittal.

If you have any questions regarding this report, please contact Ron Gaston at (630) 657-3359.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 17th day of December 2014.

Respectfully submitted,

James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

Three Mile Island Nuclear Station, Unit 1 Expedited Seismic Evaluation Process (ESEP) Report

cc: Director, Office of Nuclear Reactor Regulation
Regional Administrator - NRC Region I
NRC Senior Resident Inspector – Three Mile Island Nuclear Station, Unit 1
NRC Project Manager, NRR – Three Mile Island Nuclear Station, Unit 1
Mr. Nicholas J. DiFrancesco, NRR/JLD/JHMB, NRC
Director, Bureau of Radiation Protection - Pennsylvania Department of Environmental Resources
Chairman, Board of County Commissioners of Dauphin County, PA
Chairman, Board of Supervisors of Londonderry Township, PA
R. R. Janati, Chief, Division of Nuclear Safety, Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection

Enclosure

Three Mile Island Nuclear Station, Unit 1

Expedited Seismic Evaluation Process (ESEP) Report

(36 pages)

EXPEDITED SEISMIC EVALUATION PROCESS (ESEP) REPORT

IN RESPONSE TO THE 50.54(f) INFORMATION REQUEST REGARDING FUKUSHIMA NEAR-TERM TASK FORCE RECOMMENDATION 2.1: SEISMIC

for the

Three Mile Island Nuclear Generating Station Unit 1
Route 441S P.O. Box 480,
Middletown, PA 17057
Facility Operating License No. DPR-50
NRC Docket No. 50-289
Correspondence No. RS-14-301

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Report Number: 14Q4239-RPT-004, Rev. 3

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Document Title:
EXPEDITED SEISMIC EVALUATION PROCESS (ESEP) REPORT IN RESPONSE TO THE 50.54(f) INFORMATION REQUEST REGARDING FUKUSHIMA NEAR-TERM TASK FORCE RECOMMENDATION 2.1: SEISMIC FOR THE THREE MILE ISLAND NUCLEAR GENERATING STATION UNIT 1

Document Type:
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Project Name: Exelon ESEP for TMI
Job No.: 14Q4239
Client: Exelon

This document has been prepared in accordance with the S&A Quality Assurance Program Manual, Revision 17 and project requirements:

Initial Issue (Rev. 0)	
Prepared by: Jalal Farooq	Date: 11/21/2014
Reviewed by: Walter Djordjevic	Date: 11/21/2014
Approved by: Walter Djordjevic	Date: 11/21/2014

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Revision No.	Prepared by/ Date	Reviewed by/ Date	Approved by/ Date	Description of Revision
1	Jalal Farooq 11/26/2014	Walter Djordjevic 11/26/2014	Walter Djordjevic 11/26/2014	Minor editorial changes and clarifications.
2	Jalal Farooq 12/03/2014	Walter Djordjevic 12/03/2014	Walter Djordjevic 12/03/2014	Minor editorial changes and clarifications to sections 6.3.1, 6.3.2, and 6.5. Reference 23 added to support section 6.5.
3	Jalal Farooq 12/10/2014	Walter Djordjevic 12/10/2014	Walter Djordjevic 12/10/2014	Damping percentage stated for SSE, GMRS, and RLGM figures and tables. Minor editorial changes throughout.

Stevenson & Associates	DOCUMENT APPROVAL SHEET	CONTRACT NO. 14Q4239

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1.0 Purpose and Objective

Following the accident at the Fukushima Dai-ichi nuclear power plant resulting from the March 11, 2011, Great Tohoku Earthquake and subsequent tsunami, the Nuclear Regulatory Commission (NRC) established a Near Term Task Force (NTTF) to conduct a systematic review of NRC processes and regulations and to determine if the agency should make additional improvements to its regulatory system. The NTTF developed a set of recommendations intended to clarify and strengthen the regulatory framework for protection against natural phenomena. Subsequently, the NRC issued a 50.54(f) letter on March 12, 2012 [1], requesting information to assure that these recommendations are addressed by all U.S. nuclear power plants. The 50.54(f) letter requests that licensees and holders of construction permits under 10 CFR Part 50 reevaluate the seismic hazards at their sites against present-day NRC requirements and guidance. Depending on the comparison between the reevaluated seismic hazard and the current design basis, further risk assessment may be required. Assessment approaches acceptable to the staff include a seismic probabilistic risk assessment (SPRA), or a seismic margin assessment (SMA). Based upon the assessment results, the NRC staff will determine whether additional regulatory actions are necessary.

This report describes the Expedited Seismic Evaluation Process (ESEP) undertaken for Three Mile Island Nuclear Generating Station, Unit 1. The intent of the ESEP is to perform an interim action in response to the NRC's 50.54(f) letter [1] to demonstrate seismic margin through a review of a subset of the plant equipment that can be relied upon to protect the reactor core following beyond design basis seismic events.

The ESEP is implemented using the methodologies in the NRC endorsed guidance in EPRI 3002000704, Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic [2]. Note that the TMI-1 ESEP is based on the TMI-1 FLEX strategy as of October 9, 2014, and the TMI-1 FLEX strategy will be implemented in November 2015.

The objective of this report is to provide summary information describing the ESEP evaluations and results for TMI-1. The level of detail provided in this report is intended to enable the NRC to understand the inputs used, the evaluations performed, and the decisions made as a result of the interim evaluations for TMI-1.

2.0 Brief Summary of the FLEX Seismic Implementation Strategies

The TMI-1 FLEX strategies for Reactor Core Cooling and Heat Removal, Reactor Inventory Control/Long-term Sub-criticality and Containment Functions are summarized below. This strategy is described in Overall Integrated Plan (OIP) in Response to the March 12, 2012, Commission Order EA-12-049, including 6 month FLEX updates through August 2014 [3].

FLEX Phase 1, first four hours, strategy relies on installed plant equipment. Reactor Coolant System Inventory control relies upon low leakage RCP seals and stabilizing RCS temperature to ensure adequate inventory to support single phase natural circulation. Reactor core cooling and heat removal is achieved via steam release from the Once Through Steam Generators (OTSG) using the Atmospheric Dump Valves (MS-V-4A&B). Water is taken from the Condensate Storage Tanks (CO-T-1A or B), pumped with the steam turbine driven Emergency Feedwater Pump (EF-P-1) and controlled with flow control valves (EF-V-30A & B) to maintain OTSG level. Remote operation of the Atmospheric Dump Valves (MS-V-4A & B) and EFW Flow control valves (EF-V-30A & B) from the control room is used initially. Local control will be required after the instrument air supply is depleted.

Parameters required for control of reactor core cooling and containment monitoring are obtained via instrumentation which is powered from battery backed inverters. Shedding of DC loads is employed to extend battery life to six hours. No action is required to limit containment pressure within design limits. Containment integrity will be maintained.

FLEX Phase 2, hour 4 to 24, strategy relies on installed plant equipment and portable on-site equipment. The FLEX diesel generator (FX-Y-1A or B) will be started and both ES 480V power trains will be energized to provide power for vital instrumentation and FLEX equipment. Within 3 hours of diesel start, fuel oil transfer to the diesel fuel tank (FX-T-3) from DF-T-1 (30,000 gallon underground tank) will be initiated using diesel fuel pumps DF-P-1C or DF-P-1D.

The FLEX RCS makeup pump (FX-P-1A or B) will be operated to pump borated water (2500 ppmB) to the RCS from the BWST. Pressurizer level will be restored to the normal level for shutdown conditions. RCS heat removal will continue as described in Phase 1 (i.e. ADV, EFW control valves, EF-P-1 and CO-T-1A & B). When pressurizer level is restored, an RCS cooldown will be initiated at a rate as limited by RCS makeup capability. Within 12 hours, the RCS will be stabilized at approximately 400F and 400 psig. Pressurizer level will then be raised above 300 inches. The increased RCS boron concentration will maintain the reactor shutdown even after Xenon has decayed. As OTSG pressure is lowered below 200 psig, the FLEX backup capability to feed the OTSG (FX-P-2A or B) is enabled. Each pump can utilize either water source (CO-T-1A & CO-T-1B) and provide core cooling.

FLEX Phase 3, hour 24 to 72, strategy relies on installed plant equipment and portable on-site and off-site equipment. The direct means of core cooling remains as described in phase 2. A long term supply for condensate is established using portable submersible pumps (FX-P-6A or B) lowered into the ISPH pump bay. These pumps can be used to pump river water via hose to Condensate Tank 1B. The fuel oil and borated water supply will be sufficient for more than seven days before re-supply is required.

3.0 Equipment Selection Process and ESEL and Alternate Path Justifications

The selection of equipment for the Expedited Seismic Equipment List (ESEL) [19] followed the guidelines of EPRI 3002000704 [2]. The ESEL for Unit 1 is presented in Attachment A.

3.1 Equipment Selection Process and ESEL

The selection of equipment on the ESEL was based on installed plant equipment credited in the FLEX strategies during Phase 1, 2 and 3 mitigation of a Beyond Design Basis External Event (BDBEE), as outlined in the TMI-1 Overall Integrated Plan (OIP) in Response to the March 12, 2012, Commission Order EA-12-049 [3]. The OIP, including 6 month updates through August 2014, provides the TMI-1 FLEX mitigation strategy and serves as the basis for the equipment selected for the ESEP.

The scope of "installed plant equipment" includes equipment relied upon for the FLEX strategies to sustain the critical functions of core cooling and containment integrity consistent with the TMI-1 OIP [3]. FLEX recovery actions are excluded from the ESEP scope per EPRI 3002000704 [2]. The overall list of planned FLEX modifications and the scope for consideration herein is limited to those required to support core cooling, reactor coolant inventory, sub-criticality, and containment integrity functions. Portable and pre-staged FLEX equipment (not permanently installed) are excluded from the ESEL per EPRI 3002000704 [2].

The ESEL component selection followed the EPRI guidance outlined in Section 3.2 of EPRI 3002000704 [2].

1. The scope of components is limited to those required to accomplish the core cooling and containment safety functions identified in Table 3-2 of EPRI 3002000704. The instrumentation monitoring requirements for core cooling/containment safety functions are limited to those outlined in the EPRI 3002000704 guidance, and are a subset of those outlined in the TMI-1 OIP [3].

2. The scope of components is limited to installed plant equipment, and FLEX connections necessary to implement the TMI-1 OIP [3] as described in Section 2.

3. The scope of components assumes the credited FLEX connection modifications are implemented, and are limited to those required to support a single FLEX success path (i.e., either "Primary" or "Back-up/Alternate").

4. The "Primary" FLEX success path is to be specified. Selection of the "Back-up/Alternate" FLEX success path must be justified.

5. Phase 3 coping strategies are included in the ESEP scope, whereas recovery strategies are excluded.

6. Structures, systems, and components excluded per the EPRI 3002000704 [2] guidance are:

   - Structures (e.g. containment, reactor building, control building, auxiliary building, etc.)
   - Piping, cabling, conduit, HVAC, and their supports.
   - Manual valves and rupture disks.
   - Power-operated valves not required to change state as part of the FLEX mitigation strategies.

- Nuclear steam supply system components (e.g. reactor pressure vessel and internals, reactor coolant pumps and seals, etc.)

7. For cases in which neither train was specified as a primary or back-up strategy, then only one train component (generally 'A' train) is included in the ESEL.

3.1.1 ESEL Development

The ESEL was developed by reviewing the TMI-1 OIP, including 6 month FLEX updates through August 2014 [3], to determine the major equipment involved in the FLEX strategies. Further reviews of plant drawings (e.g., Process and Instrumentation Diagrams (P&IDs) and Electrical One Line Diagrams) were performed to identify the boundaries of the flow paths to be used in the FLEX strategies and to identify specific components in the flow paths needed to support implementation of the FLEX strategies. Boundaries were established at an electrical or mechanical isolation device (e.g., isolation amplifier, valve, etc.) in branch circuits / branch lines off the defined electrical or fluid flow path. P&IDs were the primary reference documents used to identify mechanical components and instrumentation. The flow paths used for FLEX strategies were selected and specific components were identified using detailed equipment and instrument drawings, piping isometrics, electrical schematics and one-line diagrams, system descriptions, design basis documents, etc., as necessary.

The flow paths credited for the TMI-1 ESEP are shown in Table 3-1 below.

Table 3-1: Flow Paths Credited for ESEP

Flow Path	FLEX Drawing [20]	P&IDs [21]	
Main Steam from the Steam Generators to the Turbine Driven Emergency Feedwater Pump	N/A	302-011 302-012 302-032	302-121 302-141 302-710
Emergency Feedwater from the Condensate Storage Tank to the Steam Generators	1E-919-21-003	302-032 302-082 302-101	302-102 302-159 302-163
Reactor Coolant Make Up from the Borated Water Storage Tank to the Reactor	1E-919-21-004	302-640 302-650 302-651 302-660 302-661	302-669 302-690 302-711 302-712
Fuel Oil from the Diesel Generator Fuel Storage Tank to the FLEX Connection Point	1E-919-21-001	302-283	302-351

3.1.2 Power Operated Valves

Page 3-3 of EPRI 3002000704 [2] notes that power operated valves not required to change state are excluded from the ESEL. Page 3-2 also notes that "functional failure modes of electrical and mechanical portions of the installed Phase 1 equipment should be considered (e.g. RCIC/AFW trips)." To address this concern, the following guidance is applied in the TMI-1 ESEL for functional failure modes associated with power operated valves:

- Power operated valves that remain energized during the Extended Loss of all AC Power (ELAP) events (such as DC powered valves), were included on the ESEL.
- Power operated valves not required to change state as part of the FLEX mitigation strategies were not included on the ESEL. The seismic event also causes the ELAP event; therefore, the valves are incapable of spurious operation as they would be de-energized.
- Power operated valves not required to change state as part of the FLEX mitigation strategies during Phase 1, and are re-energized and operated during subsequent Phase 2 and 3 strategies, were not evaluated for spurious valve operation as the seismic event that caused the ELAP has passed before the valves are re-powered.

3.1.3 Pull Boxes

Pull boxes were deemed unnecessary to add to the ESELs as these components provide completely passive locations for pulling or installing cables. No breaks or connections in the cabling are included in pull boxes. Pull boxes were considered part of conduit and cabling, which are excluded in accordance with EPRI 3002000704 [2].

3.1.4 Termination Cabinets

Termination cabinets, including cabinets necessary for FLEX Phase 2 and Phase 3 connections, provide consolidated locations for permanently connecting multiple cables. The termination cabinets and the internal connections provide a completely passive function; however, the cabinets are included in the ESEL to ensure industry knowledge on panel/anchorage failure vulnerabilities is addressed and the connections are excluded from the ESEL.

3.1.5 Critical Instrumentation Indicators

Critical indicators and recorders are typically physically located on panels/cabinets and are included as separate components; however, seismic evaluation of the instrument indication may be included in the panel/cabinet seismic evaluation (rule-of-the-box).

3.1.6 Phase 2 and Phase 3 Piping Connections

Item 2 in Section 3.1 above notes that the scope of equipment in the ESEL includes "... FLEX connections necessary to implement the TMI-1 OIP [3] as described in Section 2." Item 3 in Section 3.1 notes that "The scope of components assumes the credited FLEX connection modifications are implemented, and are limited to those required to support a single FLEX success path (i.e., either "Primary" or "Back-up/Alternate")." Item 6 in Section 3 goes on to explain that "Piping, cabling, conduit, HVAC, and their supports" are excluded from the ESEL scope in accordance with EPRI 3002000704 [2].

Therefore, piping and pipe supports associated with FLEX Phase 2 and Phase 3 connections are excluded from the scope of the ESEP evaluation. However, any active valves in the FLEX Phase 2 and Phase 3 connection flow path are included in the ESEL.

3.2 Justification for use of Equipment that is not the Primary Means for FLEX Implementation

All equipment used for FLEX implementation on the TMI-1 ESEL are primary path.

4.0 Ground Motion Response Spectrum (GMRS)

4.1 Plot of GMRS Submitted by the Licensee

In accordance with Section 2.4.2 of the SPID [14], the licensing design basis definition of the SSE control point for TMI-1 is used for comparison to the GMRS. The TMI-1 March Submittal [4], states that the site SSE, anchored to a PGA of 0.12g, is defined at the bedrock-soil interface elevation of 280 feet.

The GMRS, taken from the TMI-1 March submittal report [4], is shown in Table 4-1 and Figure 4-1.

Table 4-1: TMI-1 GMRS (5% Damping)

Freq. (Hz)	GMRS (unscaled, g)
0.1	0.01
0.125	0.01
0.15	0.01
0.2	0.02
0.25	0.02
0.3	0.02
0.35	0.03
0.4	0.03
0.5	0.04
0.6	0.05
0.7	0.06
0.8	0.07
0.9	0.07
1	0.08
1.25	0.10
1.5	0.12
2	0.15
2.5	0.17
3	0.20
3.5	0.24
4	0.28
5	0.34
6	0.37
7	0.41
8	0.43
9	0.45
10	0.46
12.5	0.47
15	0.46
20	0.43
25	0.40
30	0.38
35	0.35
40	0.32
50	0.28
60	0.25
70	0.23
80	0.23
90	0.23
100	0.23

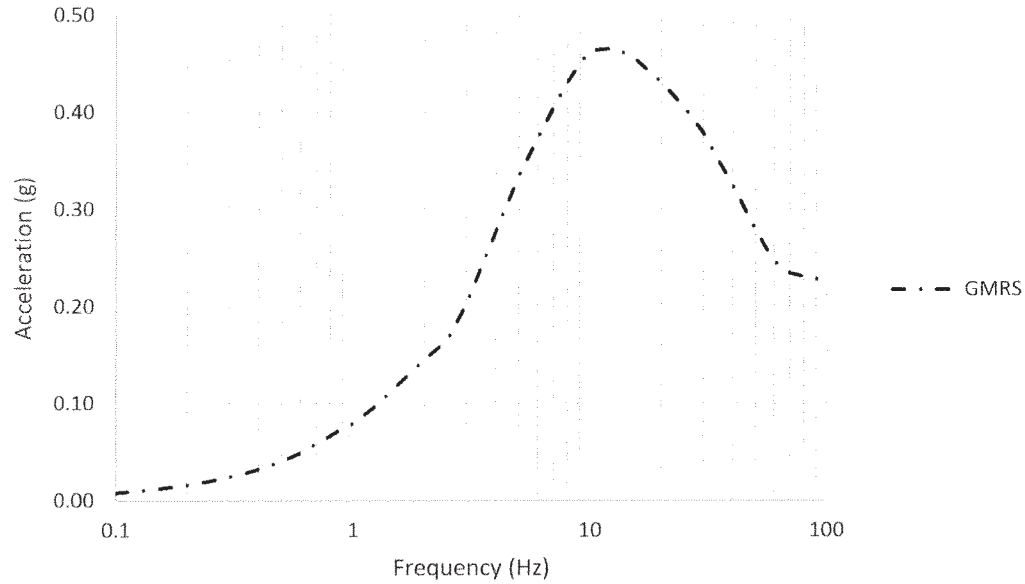

Figure 4-1: TMI-1 GMRS (5% Damping)

4.2 Comparison to SSE

As identified in the TMI-1 March submittal report [4], the GMRS exceeds the SSE in the 1-10Hz range. A comparison of the GMRS to the SSE between 1-10Hz is shown in Table 4-2 and Figure 4-2.

Table 4-2: TMI-1 GMRS and SSE between 1-10Hz (5% Damping)

Freq. (Hz)	GMRS (unscaled, g)	Horizontal SSE (g)
1	0.079	0.170
1.25	0.097	0.180
1.5	0.116	0.230
2	0.145	0.270
2.5	0.165	0.300
3	0.202	0.320
3.5	0.242	0.340
4	0.276	0.360
5	0.335	0.400
6	0.373	0.420
7	0.405	0.430
8	0.430	0.430
9	0.449	0.420
10	0.463	0.410

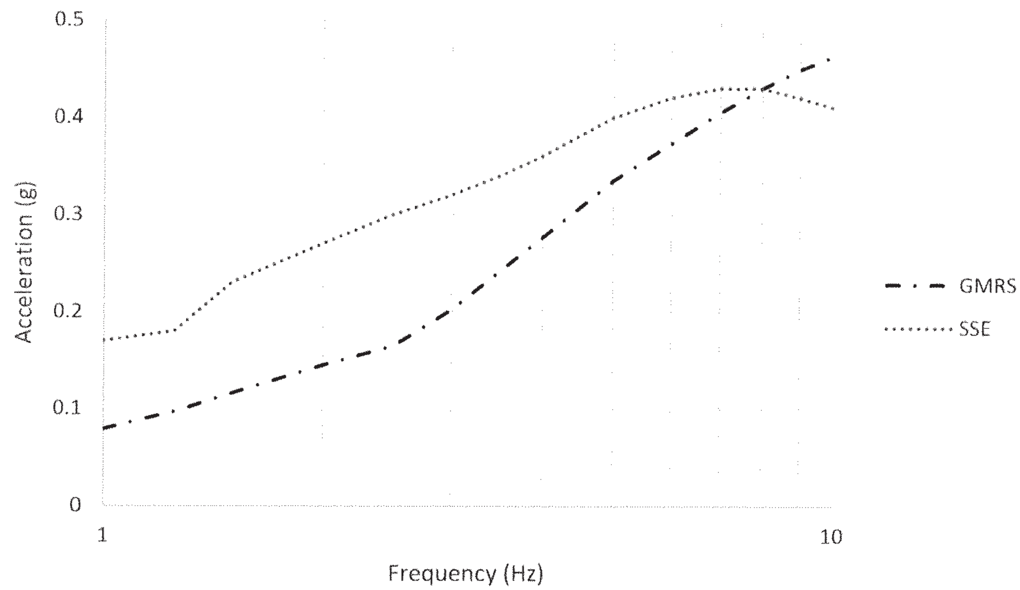

Figure 4-2: TMI-1 GMRS to SSE Comparison (5% Damping)

5.0 Review Level Ground Motion (RLGM)

5.1 Description of RLGM Selected

The RLGM for TMI-1 was determined in accordance with Section 4 of EPRI 3002000704 [2] by linearly scaling the TMI-1 SSE by the maximum GMRS/SSE ratio between the 1 and 10Hz range. This calculation is shown in Table 5-1.

Table 5-1: TMI-1 Maximum GMRS/SSE Ratio (5% Damping)

Freq. (Hz)	GMRS (unscaled, g)	Horizontal SSE (g)	GMRS/SSE Ratio
1	0.079	0.170	0.46
1.25	0.097	0.180	0.54
1.5	0.116	0.230	0.50
2	0.145	0.270	0.54
2.5	0.165	0.300	0.55
3	0.202	0.320	0.63
3.5	0.242	0.340	0.71
4	0.276	0.360	0.77
5	0.335	0.400	0.84
6	0.373	0.420	0.89
7	0.405	0.430	0.94
8	0.430	0.430	1.00
9	0.449	0.420	1.07
10	0.463	0.410	**1.13**

As shown above, the maximum GMRS/SSE ratio for TMI-1 occurs at 10 Hz and equals 1.13.

The resulting 5% damped RLGM, based on scaling the horizontal SSE by the maximum GMRS/SSE ratio of 1.13, is shown in Table 5-2 and Figure 5-1 below. Note that the RLGM PGA is 0.14g.

Table 5-2: TMI-1 RLGM (5% Damping)

Freq. (Hz)	RLGM (g)
1	0.19
1.25	0.20
1.5	0.26
2	0.31
2.5	0.34
3	0.36
4	0.41
5	0.45
6	0.47
7	0.49
8	0.49
9	0.47
10	0.46
12.5	0.41
15	0.33
20	0.24
25	0.20
30	0.19

Table 5-2: TMI-1 RLGM (5% Damping)

Freq. (Hz)	RLGM (g)
35	0.17
40	0.17
50	0.16
60	0.16
70	0.15
80	0.15
90	0.14
100	0.14

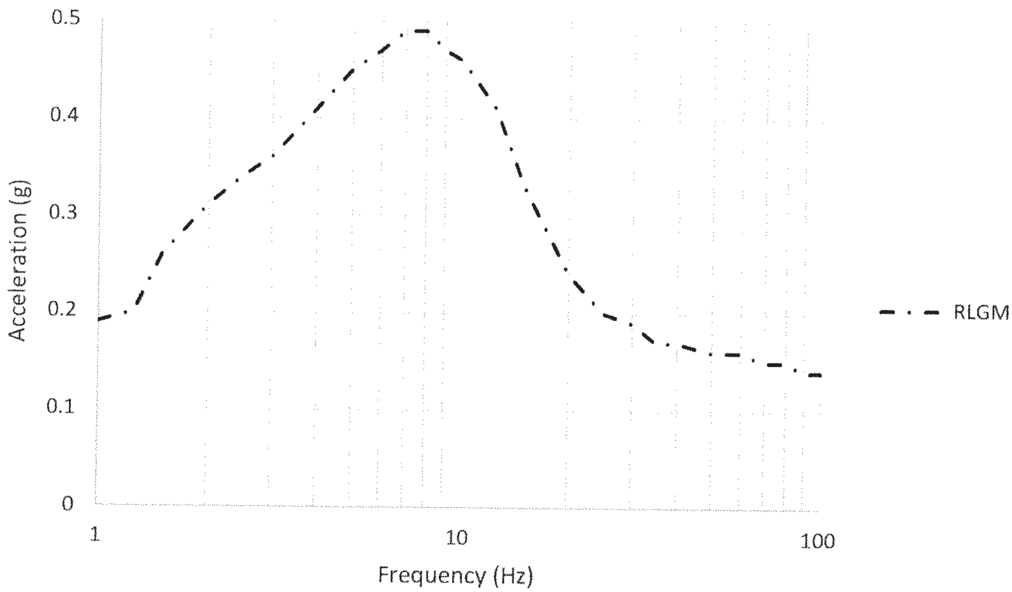

Figure 5-1: TMI-1 RLGM (5% Damping)

5.2 Method to Estimate ISRS

The method used to derive the ESEP in-structure response spectra (ISRS) was to uniformly scale existing SSE-based ISRS from 50097-R-001 [17] by the maximum GMRS/SSE ratio from Table 5-1 of 1.13. ISRS used for the ESEP were developed for the USI A-46 program. Scaled ISRS are calculated for all buildings and elevations where ESEL items are located at TMI-1. These scaled ISRS are documented within Tech Eval 14-00473 [10].

6.0 Seismic Margin Evaluation Approach

It is necessary to demonstrate that ESEL items have sufficient seismic capacity to meet or exceed the demand characterized by the RLGM. The seismic capacity is characterized as the highest peak ground acceleration (PGA) for which there is a high confidence of a low probability of failure (HCLPF). The PGA is associated with a particular spectral shape, in this case the 5% damped RLGM spectral shape. The calculated HCLPF capacity must be equal to or greater than the RLGM PGA (0.14g from Table 5-2). The criteria for seismic capacity determination are given in Section 5 of EPRI 3002000704 [2].

There are two basic approaches for developing HCLPF capacities:

1. Deterministic approach using the conservative deterministic failure margin (CDFM) methodology of EPRI NP-6041 [7].
2. Probabilistic approach using the fragility analysis methodology of EPRI TR-103959 [8].

For TMI-1, the deterministic approach using the CDFM methodology of EPRI NP-6041 [7] was used to determine HCLPF capacities.

6.1 Summary of Methodologies Used

TMI-1 performed a probabilistic risk assessment (PRA) in 1994. The PRA is documented in the TMI-1 IPEEE report [9] and consisted of walkdowns and HCLPF calculations. The walkdowns were conducted by engineers trained in EPRI NP-6041 and PRA. Walkdown results were documented on Screening Evaluation Work Sheets (SEWS) from EPRI NP-6041[7] in concert with the USI A-46 evaluation of TMI-1.

Within ESEP, TMI-1 conservatively applied the methodology of EPRI NP-6041 [7] to all 'existing' (i.e. installed prior to FLEX modifications) items on the ESEL. Note that 'new' items on the TMI-1 ESEL represent equipment items not currently installed and are thus not evaluated herein. 'New' ESEL items are noted (1) in Table A-1. These items will, however, be designed and procured to meet the higher seismic requirements imposed by being on the ESEL. The performed screening used Table 2-4 from EPRI NP-6041 [7]. The walkdowns were conducted by engineers who, as a minimum, have attended the SQUG Walkdown Screening and Seismic Evaluation Training Course. The walkdowns were documented in SEWS (contained within Tech Eval 14-00473 [10]) from EPRI NP-6041 [7]. Anchorage capacity calculations use the CDFM criteria established within EPRI NP-6041 [7] with TMI-1 specific allowables and material strengths used as applicable. The input seismic demand used was the RLGM shown in Table 5-2 and Figure 5-1.

6.2 HCLPF Screening Process

From Table 5-2, the spectral peak of the RLGM for TMI equals 0.49g. Screening lanes 1 and 2 in Table 2-4 of NP-6041 [7] are bounded by peak spectral accelerations of 0.8g and 1.2g, respectively. Both lane limits exceed the RLGM peak spectral acceleration. TMI ESEL components were screened to lane 1 of Table 2-4 in NP-6041 [7]. Note that the lane 1 spectral peak of 0.8g corresponds to a PGA of 0.3g.

The TMI-1 ESEL contains 100 items [19]. Of these, 18 are valves, both power-operated and relief. In accordance with Table 2-4 of EPRI NP-6041 [7], active valves may be assigned a functional capacity of 0.8g (relative to the spectral peak) only requiring a review of valves with large extended operators on small diameter piping. Note that anchorage is not a failure mode. Valves on the ESEL may be screened out, subject to the caveat regarding large extended operators on small diameter piping. The non-valve components in the ESEL were evaluated to the remaining EPRI NP-6041 Table 2-4 [7] screening caveats, as applicable. The screening results are summarized in Attachment B.

6.3 Seismic Walkdown Approach

6.3.1 Walkdown Approach

Walkdowns for TMI-1 were performed in accordance with the criteria provided in Section 5 of EPRI 3002000704 [2], which refers to EPRI NP-6041 [7] for the Seismic Margin Assessment process. Pages 2-26 through 2-30 of EPRI NP-6041 [7] describe the seismic walkdown criteria, including the following key criteria:

> *"The SRT [Seismic Review Team] should "walk by" 100% of all components which are reasonably accessible and in non-radioactive or low radioactive environments. Seismic capability assessment of components which are inaccessible, in high-radioactive environments, or possibly within contaminated containment, will have to rely more on alternate means such as photographic inspection, more reliance on seismic reanalysis, and possibly, smaller inspection teams and more hurried inspections. A 100% "walk by" does not mean complete inspection of each component, nor does it mean requiring an electrician or other technician to de-energize and open cabinets or panels for detailed inspection of all components. This walkdown is not intended to be a QA or QC review or a review of the adequacy of the component at the SSE level.*
>
> *If the SRT has a reasonable basis for assuming that the group of components are similar and are similarly anchored, then it is only necessary to inspect one component out of this group. The "similarity-basis" should be developed before the walkdown during the seismic capability preparatory work (Step 3) by reference to drawings, calculations or specifications. The one component or each type which is selected should be thoroughly inspected which probably does mean de-energizing and opening cabinets or panels for this very limited sample. Generally, a spare representative component can be found so as to enable the inspection to be performed while the plant is in operation. At least for the one component of each type which is selected, anchorage should be thoroughly inspected.*
>
> *The walkdown procedure should be performed in an ad hoc manner. For each class of components the SRT should look closely at the first items and compare the field configurations with the construction drawings and/or specifications. If a one-to-one correspondence is found, then subsequent items do not have to be inspected in as great a detail. Ultimately the walkdown*

becomes a "walk by" of the component class as the SRT becomes confident that the construction pattern is typical. This procedure for inspection should be repeated for each component class; although, during the actual walkdown the SRT may be inspecting several classes of components in parallel. If serious exceptions to the drawings or questionable construction practices are found then the system or component class must be inspected in closer detail until the systematic deficiency is defined.

The 100% "walk by" is to look for outliers, lack of similarity, anchorage which is different from that shown on drawings or prescribed in criteria for that component, potential SI [Seismic Interaction[1]] problems, situations that are at odds with the team members' past experience, and any other areas of serious seismic concern. If any such concerns surface, then the limited sample size of one component of each type for thorough inspection will have to be increased. The increase in sample size which should be inspected will depend upon the number of outliers and different anchorages, etc., which are observed. It is up to the SRT to ultimately select the sample size since they are the ones who are responsible for the seismic adequacy of all elements which they screen from the margin review. Appendix D gives guidance for sampling selection.

The TMI-1 walkdowns included, as a minimum, a 100% walk-by of all "existing" items on the TMI-1 ESEL except as noted in Section 7.0. Any previous walkdown information that was relied upon as the basis for SRT judgment in excluding an item walkdown is documented in Section 6.3.2.

6.3.2 Application of Previous Walkdown Information

Previous seismic walkdowns conducted for the NTTF 2.3 [15] and USI A-46 [16] programs were used to supplement the NTTF 2.1 walkdowns of TMI-1.

In general, detailed inspections were performed for NTTF 2.1 and included, as a minimum, a walk-by of all the components on the ESEL by the SRT with exception to the items listed below. A detailed discussion and resolution for each of the items listed below is provided in Section 7.0. This walkdown/walk-by was also used to confirm that no new seismic interactions[1] existed.

- DF-T-1: 30,000 Gallon Underground Tank
- DH-C-1A: Tube and Shell Heat Exchanger
- DH-C-1B: Tube and Shell Heat Exchanger
- MS-PT-951: 0 to 1200 Pressure Transmitter
- RC-PT-949: Pressure Transmitter
- RC-TE-952C: RTD

[1] EPRI 3002000704 [2] page 5-4 limits the ESEP seismic interaction reviews to "nearby block walls" and "piping attached to tanks" which are reviewed "to address the possibility of failures due to differential displacements." Other potential seismic interaction evaluations are "deferred to the full seismic risk evaluations performed in accordance with EPRI 1025287 [14]."

All non-energized cabinets were opened when specialized tools were not needed to operate the cabinet doors. As applicable, photos taken during the NTTF 2.3 walkdowns for TMI-1 and existing calculations and SEWS from the USI A-46 evaluation of TMI-1 were also utilized to aid the SRT for screening and HCLPF evaluations within ESEP.

6.3.3 Significant Walkdown Findings

Consistent with the guidance from NP-6041 [7], no significant outliers or anchorage concerns were identified during the TMI-1 ESEP walkdowns.

6.4 HCLPF Calculation Process

ESEL items were evaluated using the criteria in EPRI NP-6041 [7]. Those evaluations included the following steps:

- Performing seismic capability walkdowns for equipment to evaluate the equipment installed plant conditions
- Performing screening evaluations using the screening tables in EPRI NP-6041 [7] as described in Section 6.2
- Performing HCLPF calculations considering various failure modes that include both structural (e.g. anchorage, load path etc.) and functional failure modes.

All HCLPF calculations were performed using the CDFM methodology and are documented in Tech Eval 14-00473 [10].

Anchorage configurations for non-valve components were evaluated either by SRT judgment, large margins in existing design basis calculations, or CDFM based HCLPF calculations [10]. The results of these analysis methods are documented in Attachment B. For components beyond 40 feet above grade, Table 2-4 of NP-6041 [7] is not directly applicable.

EPRI 3002000704 [2] Section 5 references EPRI 1019200 [18] with respect to screening criteria beyond 40 feet above grade. This guide update allows multiplying the screening lane spectral acceleration value ranges by a factor of 1.5 in order to account for spectral accelerations at the base of the component. This screening level at the base of a component is compared to the ISRS demand corresponding to the RLGM. For example, by factoring the acceleration ranges for screening lane 1 of NP-6041-SL Table 2-4, the capacity at the base of a component is bounded by 0.8g*1.5 = 1.2g. This is compared with the seismic demand presented by the ISRS (as opposed to the RLGM).

ESEP equipment items which are beyond 40 feet above grade are located in the Control Building (CB) at elevation 355'. The 5% damped horizontal response spectra at this elevation are documented in Tech Eval 14-00473 [10]. The spectral peak at this location is 0.85g, falling comfortably within the lane 1 bound of 1.2g. Note that while Reactor Building (RB) elevation 346' is also greater than 40 feet above grade and has an ESEL component, it is not addressed because the ESEL item at this elevation (RC-

PT-949) is a pressure transmitter which has screened out through a review of existing documentation. Pressure transmitters in general are seismically rugged with GERS spectral capacities of 10g as documented in EPRI NP-5223-SL, Section 3.11 [22].

As described in Section 6.0, for HCLPF calculations the conservative, deterministic failure margin (CDFM) analysis criteria established in Section 6 of EPRI NP-6041 [7] are used for a detailed analysis of components. The relevant CDFM criteria from EPRI NP-6041 [7] are summarized in Table 6-1.

Table 6-1: HCLPF Calculation Summary

Load combination:	Normal + Ec
Ground response spectrum:	Conservatively specified (84% non-exceedance probability)
Damping:	Conservative estimate of median damping.
Structural model:	Best estimate (median) + uncertainty variation in frequency.
Soil-structure interaction	Best estimate (median) + parameter variation
Material strength:	Code specified minimum strength or 95% exceedance of actual strength if test data is available.
Static capacity equations:	Code ultimate strength (ACI), maximum strength (AISC), Service Level D (ASME) or functional limits. If test data is available to demonstrate excessive conservatism of code equations then use 84% exceedance of test data for capacity equations.
Inelastic energy absorption:	For non-brittle failure modes and linear analysis, use 80% of computed seismic stress in capacity evaluation to account for ductility benefits or perform nonlinear analysis and use 95% exceedance ductility levels.
In-structure (floor) spectra generation:	Use frequency shifting rather than peak broadening to account for uncertainty and use median damping.

The HCLPF capacity is equal to the PGA at which the strength limit is reached. The HCLPF earthquake load is calculated as follows:

U = Normal + Ec

Where:

- U = Ultimate strength per Section 6 of EPRI NP-6041 [7]
- Ec = HCLPF earthquake load
- Normal = Normal operating loads (dead and live load expected to be present, etc.)

For this calculation, the HCLPF earthquake load is related to a fixed reference earthquake:

Ec = SFc*Eref

Where:

- Eref = reference earthquake from the relevant in-structure response spectrum (ISRS)
- SFc = component-specific scale factor that satisfies U = Normal +Ec

The HCLPF will be defined as the PGA produced by Ec. Because the TMI-1 RLGM PGA is 0.14g:

HCLPF = 0.14g*SFc

6.5 Functional Evaluation of Relays

Three relays and one switch in the TMI-1 ESEL [19] associated with the FLEX Phase 1 response required functional evaluations. Each relay was evaluated using the SMA relay evaluation criteria in Section 3 of NP-6041 [7].

HCLPF capacities for the three relays are calculated using established GERS capacities from the NP-7147 SQUG Advisory [23]. Specific seismic qualification test-based capacities were available in TMI-1 plant documentation for the remaining switch. In-cabinet capacity to demand evaluations were performed using the TMI-1 relay seismic capacities and the ESEP ISRS scaled with the NP-6041 in-cabinet amplification factors. In each case, the capacity exceeded the demand. These results are included in Attachment B. The ESEP relay functional evaluations are documented in Tech Eval 14-00473 [10].

6.6 Tabulated ESEL HCLPF Values (Including Key Failure Modes)

Tabulated ESEL HCLPF values including the key failure modes are included in Attachment B following the criteria below:

- For items screened out using NP-6041 [7] screening tables, the HCLPF is listed as "> RLGM" (>0.14g) and the failure mode is set to "Screened".
- For items where anchorage controls the HCLPF value, the anchorage HCLPF value is listed in the table and the failure mode is set to "Anchorage".
- For items where a relay or switch HCLPF controls, the relay or switch HCLPF value is listed in the table and the failure mode is set to "Functional Failure".
- For items where an equipment capacity based upon the screening lane values of Table 2-4 of EPRI NP-6041 [7] controls the HCLPF value (e.g. anchorage or relay HCLPF capacity exceeds the equipment capacity derived from screening lanes), the screening lane HCLPF value is listed in the table and the failure mode is set to "Equipment Capacity". Based on NP-6041 Table 2-4 lane 1, this limit is equal to 0.23g for items below 40 feet above grade and 0.20g for items above 40 feet above grade (CB elevation 355' only).

The "Equipment Capacity" limits from above are calculated as follows:

The upper-bound spectral peak to NP-6041 Table 2-4 lane 1 is 0.8g. From Table 5-2, the RLGM spectral peak is 0.49g and the PGA is 0.14g. Thus, for equipment less than 40 feet above grade, the "Equipment Capacity" HCLPF is limited to 0.8/0.49*0.14 = 0.23g. From TMI-1 Tech Eval 14-00473 [10], the spectral peak at CB 355' is 0.85g. Thus, based on the discussion in section 6.4, for equipment greater than 40 feet above grade the "Equipment Capacity" HCLPF is limited to 1.2/0.85*0.14 = 0.20g.

7.0 Inaccessible Items

7.1 Identification of ESEL Items Inaccessible for Walkdowns

Six ESEL items were not accessible to the SRT during the ESEP walkdowns at TMI-1. A description of circumstances and disposition for each of these items is provided below.

DF-T-1:

This tank is buried and thus, was not accessible during the ESEP walkdowns. Per the screening criteria of Table 2-4 in EPRI NP-6041 [7], the anchorage configurations of buried tanks are inherently seismically rugged and of no concern. A review of the flexibility of attached piping for DF-T-1 was performed based on available documentation and is described in Tech Eval 14-00473 [10].

DH-C-1A and DH-C-1B:

These heat exchangers are located in heat exchanger vaults A and B and were not accessed by the SRT during the ESEP walkdowns due to ALARA concerns and fall-protection training requirements. Instead, a site Seismic Capability Engineer trained in SQUG performed photographic inspection under the direction of the SRT. This inspection was performed to the satisfaction of the SRT and a review of the photos was judged to be acceptable by the SRT.

MS-PT-951 and RC-PT-949:

These pressure transmitters were not walked down by the SRT during the at-power entry of the RB during the ESEP walkdowns due to ALARA concerns. Existing documentation and photos for these pressure transmitters exists; thus, follow-up activities for these components were deemed unnecessary. A review of the available photos and walkdown notes from the USI A-46 walkdown of TMI-1 was judged to be acceptable by the SRT.

RC-TE-952C:

This Temperature Element was not walked down by the SRT during the at-power entry of the RB during the ESEP walkdowns due to ALARA concerns. Existing documentation for this temperature element exists; thus, follow-up activities for this component were deemed unnecessary. EPRI NP-6041 Table 2-4 indicates that Temperature Sensors are inherently seismically rugged so a review of existing anchorage documentation was judged to be acceptable by the SRT.

7.2 Planned Walkdown / Evaluation Schedule / Close Out

No additional walkdowns are required.

8.0 ESEP Conclusions and Results

8.1 Supporting Information

TMI-1 has performed the ESEP as an interim action in response to the NRC's 50.54(f) letter [1]. It was performed using the methodologies in the NRC endorsed guidance in EPRI 3002000704 [2].

The ESEP provides an important demonstration of seismic margin and expedites plant safety enhancements through evaluations and potential near-term modifications of plant equipment that can be relied upon to protect the reactor core following beyond design basis seismic events.

The ESEP is part of the overall TMI-1 response to the NRC's 50.54(f) letter [1]. On March 12, 2014, NEI submitted to the NRC results of a study [12] of seismic core damage risk estimates based on updated seismic hazard information as it applies to operating nuclear reactors in the Central and Eastern United States (CEUS). The study concluded that "site-specific seismic hazards show that there [...] has not been an overall increase in seismic risk for the fleet of U.S. plants" based on the re-evaluated seismic hazards. As such, the "current seismic design of operating reactors continues to provide a safety margin to withstand potential earthquakes exceeding the seismic design basis."

The NRC's May 9, 2014 NTTF 2.1 Screening and Prioritization letter [13] concluded that the "fleetwide seismic risk estimates are consistent with the approach and results used in the GI-199 safety/risk assessment." The letter also stated that "As a result, the staff has confirmed that the conclusions reached in GI-199 safety/risk assessment remain valid and that the plants can continue to operate while additional evaluations are conducted."

An assessment of the change in seismic risk for TMI-1 was included in the fleet risk evaluation submitted in the March 12, 2014 NEI letter [12] therefore, the conclusions in the NRC's May 9 letter [13] also apply to TMI-1.

In addition, the March 12, 2014 NEI letter [12] provided an attached "Perspectives on the Seismic Capacity of Operating Plants," which (1) assessed a number of qualitative reasons why the design of Structures, Systems, and Components (SSCs) inherently contain margin beyond their design level, (2) discussed industrial seismic experience databases of performance of industry facility components similar to nuclear SSCs, and (3) discussed earthquake experience at operating plants.

The fleet of currently operating nuclear power plants was designed using conservative practices, such that the plants have significant margin to withstand large ground motions safely. This has been borne out of those plants that have actually experienced significant earthquakes. The seismic design process has inherent (and intentional) conservatisms which result in significant seismic margins within SSCs. These conservatisms are reflected in several key aspects of the seismic design process, including:

- Safety factors applied in design calculations
- Damping values used in the dynamic analysis of SSCs
- Bounding synthetic time histories for in-structure response spectra calculations
- Broadening criteria for in-structure response spectra
- Response spectra enveloping criteria typically used in SSC analysis and testing applications
- Response spectra based frequency domain analysis rather than explicit time history based time domain analysis

- Bounding requirements in codes and standards
- Use of minimum strength requirements of structural components (concrete and steel)
- Bounding testing requirements, and
- Ductile behavior of the primary materials (that is, not crediting the additional capacity of materials such as steel and reinforced concrete beyond the essentially elastic range, etc.).

These design practices combine to result in margins such that the SSCs will continue to fulfill their functions at ground motions well above the SSE.

8.2 Summary of ESEP Identified and Planned Modifications

The results of the TMI-1 ESEP performed as an interim action in response to the NRC's 50.54(f) letter [1] using the methodologies in the NRC endorsed guidance in EPRI 3002000704 [2] show that all equipment evaluated are adequate in resisting the seismic loads expected to result from the site RLGM. Therefore, no plant modifications are required as a result of the TMI-1 ESEP.

8.3 Modification Implementation Schedule

No modification implementation schedule is required because no modifications are required.

8.4 Summary of Regulatory Commitments

No regulatory commitments are required.

9.0 References

1 NRC (E Leeds and M Johnson) Letter to All Power Reactor Licensees et al., "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3 and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," March 12, 2012.

2 Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1 – Seismic. EPRI, Palo Alto, CA: May 2013. 3002000704.

3 Order Number EA-12-049 responses:

3.1 NRC Letter RS-13-026 from TMI, "Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", February 28, 2013.

3.2 NRC Letter RS-13-131 from TMI, "First Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", August 28, 2013.

3.3 NRC Letter RS-14-016 from TMI, "Second Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", February 28, 2014.

3.4 NRC Letter RS-14-214 from TMI, "Third Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", August 28, 2014.

4 TMI Seismic Hazard and Screening Report, Correspondence No. RS-14-073, dated March 26, 2014.

5 Nuclear Regulatory Commission, NUREG-1407, Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities, June 1991.

6 Nuclear Regulatory Commission, Generic Letter No. 88-20 Supplement 4, Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities - 10CFR 50.54(f), June 1991.

7 A Methodology for Assessment of Nuclear Power Plant Seismic Margin, Rev. 1, August 1991, Electric Power Research Institute, Palo Alto, CA. EPRI NP-6041.

8 Methodology for Developing Seismic Fragilities, August 1991, EPRI, Palo Alto, CA. 1994, TR-103959.

9 TMI Unit 1 Individual Plant Examination of External Events (IPEEE), December 1994.

10 TMI Tech Eval 14-00473 Rev 1, ESEP: HCLPF Evaluations.

11 Nuclear Regulatory Commission, NUREG/CR-0098, Development of Criteria for Seismic Review of Selected Nuclear Power Plants, published May 1978.

12 Nuclear Energy Institute (NEI), A. Pietrangelo, Letter to D. Skeen of the USNRC, "Seismic Core Damage Risk Estimates Using the Updated Seismic Hazards for the Operating Nuclear Plants in the Central and Eastern United States", March 12, 2014.

13 NRC (E Leeds) Letter to All Power Reactor Licensees et al., "Screening and Prioritization Results Regarding Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(F) Regarding Seismic Hazard Re-Evaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights From the Fukushima Dai-Ichi Accident," May 9, 2014.

14 Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic. EPRI, Palo Alto, CA: February 2013. 1025287.
15 TMI NTTF 2.3 Seismic Walkdown Submittal, Correspondence No. RS-12-175, dated November 8, 2012.
16 EQE Report No.: 42105-R-002 Rev. 2, Three Mile Island Unit 1, USI A-46 Seismic Evaluation Report.
17 EQE Report No.: 50097-R-001 Rev. 0, Conservative Design In-Structure Response Spectra for Resolution of Unresolved Safety Issue A-46 for the Three Mile Island Nuclear Generating Station, Unit 1.
18 Seismic Fragility Applications Guide Update, December 2009, EPRI, Palo Alto, CA. 1994, 1019200.
19 S&A Report No.: 14Q4239-RPT-003 Rev 1, Validation of Expedited Seismic Equipment List.
20 TMI FLEX Drawings:
 20.1 1E-919-21-003, Rev. 0A, TMI FLEX Flow Diagram Feedwater System.
 20.2 1E-919-21-004, Rev. 0A, TMI FLEX Flow Diagram Reactor Coolant and Spent Fuel Make-Up System.
 20.3 1E-919-21-001, Rev. 0A, TMI FLEX Flow Diagram Diesel Generator System.
21 TMI P&IDs:
 21.1 302-011, Rev. 76, Main Steam Flow Diagram.
 21.2 302-012, Rev. 10, Main Steam to Relief Valve Post Supports Flow Diagram.
 21.3 302-032, Rev. 18, Main Steam and Feedwater Instrumentation Flow Diagram.
 21.4 302-082, Rev. 24, Emergency Feedwater Flow Diagram.
 21.5 302-101, Rev. 66, Condensate Flow Diagram.
 21.6 302-102 Sheet 1, Rev. 10, Miscellaneous Condensate Drains Flow Diagram.
 21.7 302-121, Rev. 44, Feed Pump Turbine Drains Flow Diagram.
 21.8 302-141, Rev. 29, Turbine Gland Steam And Drains Flow Diagram.
 21.9 302-159, Rev. 10, Turbine Building Sump Flow Diagram Water Storage.
 21.10 302-163, Rev. 60, Cycle Makeup Demineralizers Flow Diagram.
 21.11 302-283, Rev. 26, Fuel Oil Unloading Stations to Storage Tanks Flow Diagram.
 21.12 302-351, Rev. 19, Emergency Diesel Generator Services Flow Diagram.
 21.13 302-640, Rev. 84, Decay Heat Removal Flow Diagram.
 21.14 302-650, Rev. 61, Reactor Coolant System Flow Diagram.
 21.15 302-651, Rev. 5, Reactor Coolant Flow Diagram.
 21.16 302-660, Rev. 45, Makeup and Purification Flow Diagram.
 21.17 302-661, Rev. 61, Make-Up and Purification Flow Diagram.
 21.18 302-669, Rev. 36, Chemical Addition Flow Diagram.
 21.19 302-690, Rev. 26, Liquid Waste Disposal Flow Diagram RC Bleed Tanks and Miscellaneous Waste Collection.
 21.20 302-710, Rev. 0, Steam Generator Secondary Side Blowdown And Sampling Flow Diagram.
 21.21 302-711, Rev. 28, Core Flooding Flow Diagram.
 21.22 302-712, Rev. 49, Reactor Building Spray Flow Diagram.
22 Generic Seismic Ruggedness of Power Plant Equipment (Revision 1), August 1991, Electric Power Research Institute, Palo Alto, CA. EPRI NP-5223-SL, Rev. 1.
23 SQUG Advisory Memo No.: 2004-02, Relay GERS Corrections, September 2004.

Attachment A - TMI Unit 1 ESEL

Table A-1: TMI Unit 1 ESEL

ESEL Item Number	Equipment		Operating State		Notes/Comments
	ID	Description	Normal State	Desired State	
1	CO-T-1B	265,000 Gallon Tank	Level > 16 Ft	Level > 16 Ft	
2	CO-V-008	12 Inch Butterfly Valve	Closed - Auto	Closed - Manual	
3	DF-P-1C	10 GPM Positive Displacement Pump	Standby	Running	
4	DF-P-1C-BK	Breaker (15 Amp)	Closed	Closed	
5	DF-T-1	30,000 Gallon Underground Tank	Level > 100"	Level > 100"	
6	DH-C-1A	Tube & Shell Heat Exchanger	In Service	In Service	
7	DH-C-1B	Tube & Shell Heat Exchanger	In Service	In Service	
8	DH-T-1	370,000 Gallon Tank	Level > 56 ft	Level > 56 ft	
9	DH-V-005A	14 Inch Motor Operated Gate Valve	Open	Open	
10	DH-V-005B	14 Inch Motor Operated Gate Valve	Open	Open	
11	EE-1P-12-BK2	480 VAC Breaker (600 Amp)	Open	Closed	1
12	EE-1S-12-BK	480 VAC Breaker (800 Amp)	Open	Closed	
13	EED-B-1A & EED-B-1C	2 * 125V 1420 Amp-Hr Battery	Energized	Energized	
14	EED-B-1B & EED-B-1D	2 * 125V 1420 Amp-Hr Battery	Energized	Energized	
15	EED-BC-1B	Battery Charger	In Service	In Service	
16	EED-BC-1B-BK1	480 VAC Breaker (70 Amp)	Closed	Closed	
17	EED-BC-1D	Battery Charger	In Service	In Service	
18	EED-BC-1D-BK1	480 VAC Breaker (70 Amp)	Closed	Closed	
19	EED-PNL-1A	125/250 VDC Distribution Panel	In Service	In Service	
20	EED-PNL-1B	125/250 VDC Distribution Panel	In Service	In Service	
21	EED-PNL-1E	125/250 VDC Distribution Panel	In Service	In Service	
22	EED-PNL-1F	125/250 VDC Distribution Panel	In Service	In Service	
23	EE-INV-1B	15 KVA Inverter	In Service	In Service	
24	EE-INV-1B-BK1	480 VAC Breaker (30 Amp)	Closed	Closed	
25	EE-MCC-ES-1B	480 VAC Motor Control Center	Energized	Energized	
26	EE-MCC-ES-1B-BK	480 VAC Breaker (1200 Amp)	Closed	Closed	
27	EE-PNL-FX	480 VAC Distribution Panel	Energized	Energized	1
28	EE-PNL-FX-1	120 / 208 VAC Distribution Panel	Energized	Energized	1
29	EE-PNL-FX-BK2	480 VAC Breaker (100 Amp)	Closed	Open	1
30	EE-PNL-FX-XFR	480 VAC Transfer Switch - Center Off	Open	A or B	1
31	EE-PNL-VBB	120 VAC Distribution Panel	Energized	Energized	
32	EE-SWG-480V-1S	1,000 KVA Switchgear	Energized	Energized	
33	EF-P-1	Multi Stage Centrifugal Pump (920 GPM @ 2750 Ft TDH)	Standby	Running	
34	EF-U-1	835 HP Steam Turbine Driver	Standby	Running	
35	EF-V-015A	Pressure Regulator	Throttled	Throttled	
36	EF-V-030B	3" Control Valve	Closed	Throttled	
37	EF-V-030B-EX1 (aka LC-V30B)	Hand/Auto Station	Remote	Local	
38	EF-V-030B-I/P (aka EF-FY-850A)	Current (4 to 20 mAmp) to Pneumatic Pressure Converter	In Service	In Service	
39	EF-V-030D	3" Control Valve	Closed	Throttled	
40	EF-V-030D-EX1 (aka LC-V30D)	Hand/Auto Station	Remote	Local	
41	EF-V-030D-I/P (officially EF-FY-852A)	Current (4 to 20 mAmp) to Pneumatic Pressure Converter	In Service	In Service	

Table A-1: TMI Unit 1 ESEL

ESEL Item Number	Equipment		Operating State		Notes/Comments
	ID	Description	Normal State	Desired State	
42	FW-LI-776B	Digital Indicator	In Service	In Service	
43	FW-LI-789B	Digital Indicator	In Service	In Service	
44	FW-LT-776	Level Transmitter (0 - 640 Inches)	In Service	In Service	
45	FW-LT-789	Level Transmitter (0 - 640 Inches)	In Service	In Service	
46	FX-LI-1001	Graduated Sight Glass (Tygon Tube) 300 to 330 Ft Elevation	Standby	In Service	1
47	FX-LI-1003	Graduated Sight Glass	In Service	In Service	1
48	FX-P-1B	75 HP 480VAC TEFC Motor	Standby	Running (A or B)	1
49	FX-P-1B	40 GPM Positive Displacement Pump (2600 psig)	Standby	Running (A or B)	1
50	FX-P-1B-BK	480 VAC Breaker (150 Amp)	Open	Closed	1
51	FX-P-1B-EX4	480 VAC Motor Controller	Off	On	1
52	FX-T-3	120 Gallon Fuel Oil Tank	110 to 120 gallons	> 20 gal.	1
53	FX-Y-1B	500kW 480VAC Diesel Generator	Standby	Operating	1
54	FX-Y-1B-BK	480V Breaker	Open	Closed	1
55	HSPS-TR-B	Instrument Cabinet	In Service	In Service	
56	IA-PC-1013	Pneumatic Pressure Controller	In Service	In Service	
57	IA-PC-1014	Pneumatic Pressure Controller	In Service	In Service	
58	IA-T-2A, 3A, 4A, 5A, 6A, 7A, 8A, 20, 21	2000# Rated Gas Cylinders Connected to a Common Manifold	> 1500 psig	> 60 psig	
59	IA-T-2B, 3B, 4B, 5B, 6B, 7B, 8B	2000# Rated Gas Cylinders Connected to a Common Manifold	> 1500 psig	> 60 psig	
60	IA-V-1621A	1 Inch Air Operated Control Valve	Closed	Throttled	
61	IA-V-1621B	1 Inch Air Operated Control Valve	Closed	Throttled	
62	IA-V-1626A	1 Inch Air Operated Three Way Valve	Normal IA	Bottles	
63	IA-V-1626B	1 Inch Air Operated Three Way Valve	Normal IA	Bottles	
64	MS-PC-5	Pneumatic Pressure Controller	Operating	Operating	
65	MS-PI-1180	Digital Indicator	In Service	In Service	
66	MS-PI-204A	Pressure Indicator (Mechanical)	In Service	In Service	
67	MS-PI-21	Pressure Indicator (Mechanical)	Isolated	In Service	
68	MS-PI-22	Pressure Indicator (Mechanical)	Isolated	In Service	
69	MS-PI-951A	Digital Indicator	In Service	In Service	
70	MS-PT-1180	0 to 1200 Pressure Transmitter	In Service	In Service	
71	MS-PT-951	0 to 1200 Pressure Transmitter	In Service	In Service	
72	MS-V-004A	6" Air Operated Control Valve	Closed	Throttled	
73	MS-V-004AB-AR23	120 VAC Relay - Struthers Dunn Model No. 219BBXP33	In Service	In Service	
74	MS-V-004AB-PS	120 VAC to 24 VDC Power Supply	In Service	In Service	
75	MS-V-004A-EI (alias HY005A)	Voltage to Current Converter	In Service	In Service	

Table A-1: TMI Unit 1 ESEL

ESEL Item Number	Equipment		Operating State		Notes/Comments
	ID	Description	Normal State	Desired State	
76	MS-V-004A-EX1 (alias HIC-005)	Remote Manual Control Station	ICS	Local	
77	MS-V-004A-I/P (alias MS-HY-5B)	Current (4 to 20 mAmp) to Pneumatic Pressure Converter	In Service	In Service	
78	MS-V-004B	6" Air Operated Control Valve	Closed	Throttled	
79	MS-V-004B-EI (alias HY006A)	Voltage to Current Converter	In Service	In Service	
80	MS-V-004B-EX1 (alias HIC-006)	Remote Manual Control Station	ICS	Local	
81	MS-V-004B-I/P (alias MS-HY-6B)	Current (4 to 20 mAmp) to Pneumatic Pressure Converter	In Service	In Service	
82	MS-V-006	6 Inch Air Operated Control Valve	Throttled	Throttled	
83	MS-V-010A	6" Motor Operated Gate Valve	Closed	Throttled	
84	MS-V-013B	2 Inch Air Operated Globe Valve	Closed	Open	
85	MU-TS-1	Temperature Switch - Barksdale DeLaval Model # MTIH-M154S-12-A	In Service	In Service	
86	MU-V-003	2.5" Air Operated Globe Valve	Open	Closed	
87	MU-V-003\20X	125VDC Relay - Gould Model No. J13PA20	De-Energized	Energized	
88	MU-V-016D	2 1/2" Motor Operated Globe Valve	Closed	Open	
89	MU-V-026	4" Air Operated Globe Valve	Open	Closed	
90	MU-V-026\20X	125 VDC Relay - Clark AO Smith Model #4U4-2	De-Energized	Energized	
91	RC-LI-777A	Digital Indicator	In Service	In Service	
92	RC-LT-777	0 to 400" Level Range Above 314'8" Elev.	In Service	In Service	
93	RC-PI-949A	Digital Indicator (0 to 3000 psig)	In Service	In Service	
94	RC-PT-949	Pressure Transmitter	In Service	In Service	
95	RC-TE-952C	RTD	In Service	In Service	
96	RC-TI-952	Digital Indicator	In Service	In Service	
97	RSTSP-A	Instrument Cabinet	In Service	In Service	
98	SCC-B1	Instrument System Cabinet With Power and Signal Conditioning Equipment	In Service	In Service	
99	SCC-B2	Instrument System Cabinet With Power and Signal Conditioning Equipment	In Service	In Service	
100	XCL	Relay Cabinet	In Service	In Service	

Notes:
1. ESEL item is not currently installed (i.e. 'new' as described in section 6.1). HCLPF and failure mode marked N/A in Table B-1. These items are/will be newly installed for the FLEX implementation strategy as defined in the TMI-1 OIP [3].

Attachment B - TMI Unit 1 ESEP HCLPF Values and Failure Mode Tabulation

Table B-1: TMI Unit 1 ESEP HCLPF Values and Failure Mode Tabulation

ESEL Item Number	Equipment ID	Failure Mode	HCLPF (g)	Additional Discussion
1	CO-T-1B	Equipment Capacity	0.23	HCLPF calculated in Tech Eval 14-00473.
2	CO-V-008	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
3	DF-P-1C	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
4	DF-P-1C-BK	Screened	>RLGM	Rule of Box to EE-MCC-ES-1B. See parent
5	DF-T-1	Screened	>RLGM	Meets NP-6041 screening lane 1 criteria, flexibility of attached piping OK as discussed in Tech Eval 14-00473.
6	DH-C-1A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing documentation provides adequate margin.
7	DH-C-1B	Screened	>RLGM	Similar to DH-C-1A
8	DH-T-1	Anchorage	0.18	HCLPF calculated in Tech Eval 14-00473.
9	DH-V-005A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
10	DH-V-005B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
11	EE-1P-12-BK2	N/A	N/A	Not currently installed.
12	EE-1S-12-BK	Anchorage	0.17	Rule of Box to EE-SWG-480V-1S. See parent
13	EED-B-1A & EED-B-1C	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing documentation provides adequate margin.
14	EED-B-1B & EED-B-1D	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing documentation provides adequate margin.
15	EED-BC-1B	Equipment Capacity	0.23	HCLPF calculated in Tech Eval 14-00473.
16	EED-BC-1B-BK1	Anchorage	0.17	Rule of Box to EE-SWG-480V-1S. See parent.
17	EED-BC-1D	Equipment Capacity	0.23	Similar to EED-BC-1B
18	EED-BC-1D-BK1	Screened	>RLGM	Rule of Box to EE-MCC-ES-1B. See parent
19	EED-PNL-1A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing documentation provides adequate margin.
20	EED-PNL-1B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing documentation provides adequate margin.
21	EED-PNL-1E	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing documentation provides adequate margin.
22	EED-PNL-1F	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing documentation provides adequate margin.
23	EE-INV-1B	Equipment Capacity	0.23	HCLPF calculated in Tech Eval 14-00473.
24	EE-INV-1B-BK1	Screened	>RLGM	Rule of Box to EE-MCC-ES-1B. See parent
25	EE-MCC-ES-1B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing documentation provides adequate margin.
26	EE-MCC-ES-1B-BK	Screened	>RLGM	Rule of Box to EE-MCC-ES-1B. See parent
27	EE-PNL-FX	N/A	N/A	Not currently installed.
28	EE-PNL-FX-1	N/A	N/A	Not currently installed.
29	EE-PNL-FX-BK2	N/A	N/A	Not currently installed.

Table B-1: TMI Unit 1 ESEP HCLPF Values and Failure Mode Tabulation

ESEL Item Number	Equipment ID	Failure Mode	HCLPF (g)	Additional Discussion
30	EE-PNL-FX-XFR	N/A	N/A	Not currently installed.
31	EE-PNL-VBB	Anchorage	0.20	HCLPF calculated in Tech Eval 14-00473.
32	EE-SWG-480V-1S	Anchorage	0.17	HCLPF calculated in Tech Eval 14-00473.
33	EF-P-1	Equipment Capacity	0.23	HCLPF calculated in Tech Eval 14-00473.
34	EF-U-1	Equipment Capacity	0.23	Rule of Box to EF-P-1. See parent.
35	EF-V-015A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
36	EF-V-030B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
37	EF-V-030B-EX1 (aka LC-V30B)	Equipment Capacity	0.20	Rule of Box to CR Console CC. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
38	EF-V-030B-I/P (aka EF-FY-850A)	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
39	EF-V-030D	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
40	EF-V-030D-EX1 (aka LC-V30D)	Equipment Capacity	0.20	Rule of Box to CR Console CC. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
41	EF-V-030D-I/P (officially EF-FY-852A)	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
42	FW-LI-776B	Equipment Capacity	0.20	Rule of Box to CR Panel PLF. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
43	FW-LI-789B	Equipment Capacity	0.20	Rule of Box to CR Panel PLF. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
44	FW-LT-776	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
45	FW-LT-789	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
46	FX-LI-1001	N/A	N/A	Not currently installed.
47	FX-LI-1003	N/A	N/A	Not currently installed.
48	FX-P-1B	N/A	N/A	Not currently installed.
49	FX-P-1B	N/A	N/A	Not currently installed.
50	FX-P-1B-BK	N/A	N/A	Not currently installed.
51	FX-P-1B-EX4	N/A	N/A	Not currently installed.
52	FX-T-3	N/A	N/A	Not currently installed.
53	FX-Y-1B	N/A	N/A	Not currently installed.
54	FX-Y-1B-BK	N/A	N/A	Not currently installed.
55	HSPS-TR-B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage screening based on large margin in existing calculations.
56	IA-PC-1013	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
57	IA-PC-1014	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
58	IA-T-2A, 3A, 4A, 5A, 6A, 7A, 8A, 20, 21	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
59	IA-T-2B, 3B, 4B, 5B, 6B, 7B, 8B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
60	IA-V-1621A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
61	IA-V-1621B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
62	IA-V-1626A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.

Table B-1: TMI Unit 1 ESEP HCLPF Values and Failure Mode Tabulation

ESEL Item Number	Equipment ID	Failure Mode	HCLPF (g)	Additional Discussion
63	IA-V-1626B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
64	MS-PC-5	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
65	MS-PI-1180	Equipment Capacity	0.20	Rule of Box to CR Panel PCL. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
66	MS-PI-204A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
67	MS-PI-21	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
68	MS-PI-22	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
69	MS-PI-951A	Equipment Capacity	0.20	Rule of Box to CR Panel PCL. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
70	MS-PT-1180	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
71	MS-PT-951	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
72	MS-V-004A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
73	MS-V-004AB-AR23	Functional Capacity	0.20	HCLPF calculated in Tech Eval 14-00473.
74	MS-V-004AB-PS	Equipment Capacity	0.23	Rule of Box to Multiplexer Cabinet 3 (MUX 3) HCLPF for MUX 3 calculated in Tech Eval 14-00473.
75	MS-V-004A-EI (alias HY005A)	Screened	>RLGM	Rule of Box to ICS NNI Power Monitoring Cabinet. Cabinet meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT. A review of existing cabinet documentation provides adequate margin.
76	MS-V-004A-EX1 (alias HIC-005)	Equipment Capacity	0.20	Rule of Box to CR Console CC. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
77	MS-V-004A-I/P (alias MS-HY-5B)	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
78	MS-V-004B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
79	MS-V-004B-EI (alias HY006A)	Screened	>RLGM	Similar to MS-V-004A-EI
80	MS-V-004B-EX1 (alias HIC-006)	Equipment Capacity	0.20	Rule of Box to CR Console CC. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
81	MS-V-004B-I/P (alias MS-HY-6B)	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
82	MS-V-006	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
83	MS-V-010A	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
84	MS-V-013B	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
85	MU-TS-1	Equipment Capacity	0.23	HCLPF calculated in Tech Eval 14-00473.
86	MU-V-003	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats. A review of existing documentation provides adequate margin.
87	MU-V-003\20X	Equipment Capacity	0.23	HCLPF calculated in Tech Eval 14-00473.
88	MU-V-016D	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.

Table B-1: TMI Unit 1 ESEP HCLPF Values and Failure Mode Tabulation

ESEL Item Number	Equipment ID	Failure Mode	HCLPF (g)	Additional Discussion
89	MU-V-026	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats.
90	MU-V-026\20X	Functional Capacity	0.18	HCLPF calculated in Tech Eval 14-00473.
91	RC-LI-777A	Equipment Capacity	0.20	Rule of Box to CR Console CC. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
92	RC-LT-777	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
93	RC-PI-949A	Equipment Capacity	0.20	Rule of Box to CR Panel PCL. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
94	RC-PT-949	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
95	RC-TE-952C	Screened	>RLGM	Meets NP-6041 Table 2-4 caveats / anchorage (as applicable) judged to be adequate by SRT.
96	RC-TI-952	Equipment Capacity	0.20	Rule of Box to CR Panel PLF. Enveloping control Room HCLPF calculated for CR Panel PC in Tech Eval 14-00473.
97	RSTSP-A	Equipment Capacity	0.23	HCLPF for MU-V-003\20X calculated in Tech Eval 14-00473.
98	SCC-B1	Anchorage	0.21	HCLPF calculated in Tech Eval 14-00473.
99	SCC-B2	Anchorage	0.21	Similar to SCC-B1
100	XCL	Functional Capacity	0.18	Capacity governed by functional capacity of MU-V-026\20X