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10 CFR 50.90

TMI-15-086

July 28, 2015

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

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

Subject: Supplement to License Amendment Request – Temporary Restoration of Borated Water Storage Tank Cleanup and Recirculation Operation

References:
1. Letter from James Barstow (Exelon Generation Company, LLC) to U.S. NRC, "License Amendment Request – Temporary Restoration of Borated Water Storage Tank Cleanup and Recirculation Operation," dated July 23, 2015

Pursuant to 10 CFR 50.90, Exelon Generation Company, LLC (EGC) is submitting a Supplement to the July 23, 2015, (Reference 1) request for an amendment to the Technical Specifications (TS) for Three Mile Island Nuclear Station (TMI), Unit 1. This Supplement will clarify post-submittal questions received verbally from the NRC on July 27, 2015.

This Supplement to Reference 1 provides a revised No Significant Hazards Consideration Evaluation (Attachment 1) which clarifies that the proposed marked-up procedures in Reference 1 do not significantly increase the probability or consequences of a previously evaluated accident or create the possibility of a new or different kind of accident from any accident previously evaluated. Attachment 1 supersedes the No Significant Hazards Consideration Evaluation in Reference 1 Attachment 1.

The Reference 1 submittal contained proposed marked-up procedures that contained both proposed changes to support the License Amendment Request (LAR) and non-LAR related changes, and in one case, did not clearly show the related changes. Attachments 2, 3 and 4 contain the proposed marked-up procedures and show the changes related to this LAR as bolded, red lettered and red outlined. Attachments 2, 3 and 4 supersede Attachments 5, 6 and 7, respectively, in Reference 1.

Exelon requests approval of the proposed amendment by September 25, 2015, in order to support necessary pre-outage clean-up activities for the TMI Fall 2015 Refueling Outage which is scheduled to start October 29, 2015. Once approved, the amendment shall be implemented within 7 days.

There are no regulatory commitments contained in this submittal.

Exelon has determined that the information provided in this Supplement does not impact the conclusions of the No Significant Hazards Consideration or Environmental Consideration as stated in Reference 1.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," Exelon is notifying the Commonwealth of Pennsylvania of this Supplement by transmitting a copy of this letter and its attachments to the designated state official.

Should you have any questions concerning this submittal, please contact Frank Mascitelli at (610) 765-5512.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 28th day of July 2015.

Respectfully,

D. P. Helker

David P. Helker
Manager - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachments:
1) No Significant Hazards Consideration Evaluation
2) Proposed Mark-Up Procedure OP-TM-212-501, "Cleanup of the BWST"
3) Proposed Mark-Up Procedure OP-TM-AOP-003, "Earthquake"
4) Proposed Mark-Up Procedure OP-TM-AOP-0031, "Earthquake Basis Document"

cc: USNRC Regional Administrator, Region I
USNRC Project Manager, TMI-1
USNRC Senior Resident Inspector TMI-1
Director, Bureau of Radiation Protection - PA Department of Environmental Resources

ATTACHMENT 1

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

NO SIGNIFICANT HAZARDS CONFIGURATION EVALUATION

ATTACHMENT 1

Supplement to License Amendment Request – Temporary Restoration of Borated Water Storage Tank Cleanup and Recirculation Operation

NO SIGNIFICANT HAZARDS CONSIDERATION

Exelon has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

   Response: No.

   The use of the Liquid Waste Disposal System (WDL) and the Spent Fuel Pool Cooling System (SF) to re-circulate and cleanup the BWST contents does not involve any physical changes or modifications to the plant, or create any new interfaces with the reactor coolant system. Therefore, the connection of the WDL and SF to the BWST would not affect the probability of Large and Small Break Loss of Coolant Accidents occurring. The WDL and the applicable components of the SF are not credited for safe shutdown of the plant or accident mitigation. A technical evaluation was performed to validate the seismic adequacy of the WDL piping to withstand a Safe Shutdown Earthquake (SSE). The evaluation determined sufficient margin exists in the installed piping and supports such that during an SSE, the WDL system and piping would not lose pressure boundary integrity. In addition, as additional defense-in-depth measure, administrative controls ensure that the BWST can be isolated from seismic Class II WDL piping following an SSE. Since the BWST will continue to perform its safety functions and overall system performance is not affected, the consequences of an accident are not increased.

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

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

   Response: No.

   The design of the BWST, WDL and SF systems to allow recirculation and filtration / demineralization has not been altered. No new procedures are required to start or end BWST Cleanup or Recirculation operation. Proposed changes to the existing operating procedures will provide a higher priority and quicker response to isolate the BWST from seismic Class II piping paths, if operating in Cleanup or Recirculation modes, as an additional defense-in-depth administrative control during a seismic event. Since the seismic adequacy of the interconnected WDL system and piping has been evaluated for an SSE and validated by calculations to maintain pressure boundary integrity, the BWST safety functions are not affected.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

The WDL and applicable components of the SF are not credited for safe shutdown of the plant or accident mitigation. The seismic adequacy of the BWST is maintained. The seismic evaluation determined that sufficient margin exists in the installed piping and supports such that during an SSE, the seismic Class II WDL system and piping would not lose pressure boundary integrity. Maximum piping and piping support stresses are below their respective allowables, are acceptable, and no pipe leakage will occur.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Based on the above, Exelon concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c) and, accordingly, a finding of no significant hazards consideration is justified.

4.4 CONCLUSIONS

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

ATTACHMENT 2

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

PROPOSED MARK-UP PROCEDURE OP-TM-212-501, "CLEANUP OF THE BWST"

CLEANUP OF THE BWST

1.0 PURPOSE

This procedure provides guidance to recirculate and clean up the BWST, through either Precoat Filter and, if required, either or both Cation Demineralizers.

2.0 MATERIAL AND SPECIAL EQUIPMENT

None

3.0 PRECAUTIONS, LIMITATIONS, AND PREREQUISITES

3.1 Precautions

3.1.1 To avoid loss of the precoat, do not throttle flow through a Precoat Filter to less than 60 gpm at any time.

3.2 Limitations

3.2.1 To prevent damage to Precoat Filters, do not exceed 150 psig inlet pressure to WDL-F-1A and WDL-F-1B.

3.2.2 To prevent damage to Precoat Filters, do not exceed a differential pressure of 20 psi across WDL-F-1A or WDL-F-1B.

3.2.3 To prevent damage to Precoat Filters, do not exceed 150 gpm flow rate through a single Precoat Filter (WDL-F-1A or WDL-F-1B).

3.2.4 To prevent damage to Precoat Filters resin or Cation Demineralizers resin, do not exceed 120 °F inlet temperature.

3.2.5 To prevent channeling of Cation Demineralizer resin, do not exceed 70 gpm flow rate through a Cation Demineralizer (WDL-K-2A or WDL-K-2B).

3.2.6 To prevent channeling of Cation Demineralizers resin, do not exceed 140 gpm flow rate through both Cation Demineralizers (WDL-K-2A or WDL-K-2B).

3.2.7 To prevent damage to Cation Demineralizers, do not exceed a differential pressure of 35 psi across WDL-K-2A or WDL-K-2B.

3.2.8 To prevent damage to Cation Demineralizer Resin Trap filter elements, do not exceed a differential pressure of 28 psi across WDL-F-3A or WDL-F-3B.

3.3 Prerequisites

3.3.1 **VERIFY** the Liquid Waste Disposal System is in the Operating Mode IAW OP-TM-232-000, "Liquid Waste Disposal System." ___

3.3.2 **VERIFY** the Decay Heat Removal System is in any Mode IAW OP-TM-212-000, "Decay Heat Removal System." ___

3.3.3 **VERIFY** **no** conflicting cleanup processes in progress in SF/WDL systems. ___

3.3.4 **VERIFY** BWST liquid temperature on DH4-TI (CC) is less than 120°F. ___

4.0 MAIN BODY

4.1 **IDENTIFY** one Precoat Filter to be used for the cleanup process. ___

"A" Precoat Filter _____

"B" Precoat Filter _____

4.2 **If** required for the cleanup process, **then IDENTIFY** Cation Demineralizer(s) to be used for the cleanup process. ___

"A" Cation Demineralizer _____

"B" Cation Demineralizer _____

4.3 **RECORD** the required cleanup flowrate: ___

Flow Rate
gpm

4.4 **RECORD** initial BWST level, and PPC point used to determine level. ___

Initial BWST Level	PPC Point Used (Circle)
	A0486 A0487

4.5 **VERIFY** SF-P-1A Mode Switch is **not** in the FILL FUEL TRANS CANAL position **or** the DRAIN FUEL TRANS CANAL position. ___

4.6 **VERIFY** SF-P-1B Mode Switch is **not** in the FILL FUEL TRANS CANAL position **or** the DRAIN FUEL TRANS CANAL position. ___

4.7 **If** SF-P-1A is **not** running, **then VERIFY** SF-P-1A is in PULL TO LOCK. ___

4.8 **If** SF-P-1B is **not** running, **then VERIFY** SF-P-1B is in PULL TO LOCK. ___

4.9 **If** PPC is available, **then PLACE** PPC point A0486 or A0487 on trend to monitor for BWST level changes. ___

4.10 **If** PPC is **not** available, **then MONITOR** DH-LI-808A or DH-LI-809A for BWST level changes. ___

4.11 **VERIFY** the following valves are Closed: ___

- SF-V-37 ___
- SF-V-35 ___
- SF-V-21 ___
- SF-V-18 ___
- SF-V-41 ___
- SF-V-42 ___
- SF-V-49 ___
- SF-V-44 ___
- SF-V-46 ___
- SF-V-47 ___

4.12 **OPEN** the following valves: ___

- SF-V-19 ___
- SF-V-20 ___
- SF-V-36 ___
- SF-V-45 ___
- DH-V-28 ___

NOTE: SF-V-36 has failed in the Open position. Refer to PIMS AR A2332040 and ACPS 2013-101.

4.13 **VERIFY** SF-V-36 is Open ___

4.14 **If** cleanup process is through “A” precoat filter only, **then OPEN** the following valves: ___

- WDL-V-63 ___
- WDL-V-68 ___

4.15 **If** cleanup process is through “B” precoat filter only, **then OPEN** the following valves: ___

– WDL-V-64 ___

– WDL-V-69 ___

4.16 **If** cleanup process is through “A” precoat filter and “A” Cation Demineralizer, **then OPEN** the following valves: ___

– WDL-V-63 ___

– WDL-V-65 ___

– WDL-V-70 ___

4.17 **If** cleanup process is through “A” precoat filter and “B” Cation Demineralizer, **then OPEN** the following valves: ___

– WDL-V-63 ___

– WDL-V-65 ___

– WDL-V-67 ___

– WDL-V-71 ___

4.18 **If** cleanup process is through “A” precoat filter and <u>both</u> Cation Demineralizers, **then OPEN** the following valves: ___

– WDL-V-63 ___

– WDL-V-65 ___

– WDL-V-67 ___

– WDL-V-70 ___

– WDL-V-71 ___

4.19 **If** cleanup process is through “B” precoat filter and “B” Cation Demineralizer, **then OPEN** the following valves: ___

– WDL-V-64 ___

– WDL-V-66 ___

– WDL-V-71 ___

4.20 **If** cleanup process is through "B" precoat filter and "A" Cation Demineralizer, **then OPEN** the following valves: ___

- WDL-V-64 ___
- WDL-V-66 ___
- WDL-V-67 ___
- WDL-V-70 ___

4.21 **If** cleanup process is through "B" precoat filter and <u>both</u> Cation Demineralizers, **then OPEN** the following valves: ___

- WDL-V-64 ___
- WDL-V-66 ___
- WDL-V-67 ___
- WDL-V-70 ___
- WDL-V-71 ___

4.22 **THROTTLE OPEN** SF-V-40 to between 1 and 1 ½ turns open. ___

4.23 **START** SF-P-2. ___

4.24 Perform the following to initiate cleanup process:

1. **RECORD** Precoat Filter to be used for BWST cleanup: ___

   ___ "A" Precoat Filter ___ "B" Precoat Filter

2. **PRESS and HOLD** the INITIATE PROCESS FLOW pushbutton on the Precoat Filter panel for the Precoat Filter being used for BWST cleanup. ___

3. **When** <u>either</u> of the following conditions occur, **then RELEASE** the INITIATE PROCESS FLOW pushbutton on the Precoat Filter panel: ___

   - Greater than 60 gpm flow is indicated on WDL-FR-126. ___
   - The INITIATE PROCESS FLOW pushbutton on the Precoat Filter panel has been depressed for 10 seconds. ___

4. **RECORD** process start date **and** time. ___

Start Date	Start Time

4.25 **If** no flow is indicated on WDL-FR-126, **then** perform the following: ___

1. **THROTTLE OPEN** SF-V-40 as required to obtain greater than 60 gpm flow when cleanup process is initiated. ___
2. **GO TO** Step 4.24. ___

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4.26 **IAAT** any of the following limits are approached:

- 150 gpm through one Precoat Filter on WDL-FR-126
- 140 gpm through both Cation Demineralizers on WDL-FR-126
- 70 gpm through one Cation Demineralizer on WDL-FR-126
- 20 psid on WDL-DPI-343 (WDL-F-1A) **or** WDL-DPI-344 (WDL-F-1B)
- 35 psid on WDL-DPI-348 (WDL-K-2A) **or** WDL-DPI-349 (WDL-K-2B)
- 28 psid on WDL-DPI-350 (WDL-F-3A) **or** WDL-DPI-351 (WDL-F-3B)

or cleanup flow is **not** at desired flow rate,

then THROTTLE SF-V-40 as required to maintain flow as close as possible to the desired flow rate while maintaining flow and differential pressure within limits. ☐

4.27 **If** "A" Precoat Filter is being used for BWST cleanup, **then** perform the following: ___

1. **PLACE** CA-P-5A control switch in Auto. ___
2. **PLACE** CA-V-145A control switch in Auto. ___
3. **PLACE** CA-V-202A control switch in Auto. ___

4.28 **If** "B" Precoat Filter is being used for BWST cleanup, **then** perform the following: ___

1. **PLACE** CA-P-5B control switch in Auto. ___
2. **PLACE** CA-V-145B control switch in Auto. ___
3. **PLACE** CA-V-202B control switch in Auto. ___

4.29 **IAAT** any of the following occur:

- BWST level is **not** stable
- Flow is lowered to less than or equal to 60 gpm to maintain differential pressure within limits
- Precoat Filter trips into Hold mode when lowering flow to maintain differential pressure within limits
- Shift Management directs termination of transfer

then GO TO Step 5.1

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5.0 RETURN TO NORMAL

5.1 **When** termination of BWST recirculation and cleanup is required, **then CONTINUE.** ___

5.2 **If** Precoat Filter is **not** in Hold mode, **then** perform the following: ___

1. **ESTABLISH** communications between Precoat Panel operator and operator at SF-V-40. ___
2. **THROTTLE CLOSED** SF-V-40 as required to obtain 60 gpm indicated on WDL-FR-126. ___

5.3 Perform the following to manually place the Precoat Filter on hold:

1. **If** "A" Precoat Filter is being used for BWST cleanup, **then** perform the following: ___
   A. **PLACE** CA-V-202A control switch in Open. ___
   B. **PLACE** CA-V-145A control switch in Open. ___
   C. **PLACE** CA-P-5A control switch in On. ___
2. **If** "B" Precoat Filter is being used for BWST cleanup, **then** perform the following: ___
   A. **PLACE** CA-V-202B control switch in Open. ___
   B. **PLACE** CA-V-145B control switch in Open. ___
   C. **PLACE** CA-P-5B control switch in On. ___

5.4 **PLACE** SF-P-2 control switch in Normal After Stop. ___

5.5 **RECORD** process stop date **and** time. ___

Stop Date	Stop Time

5.6 **If** cleanup process was through "A" Precoat Filter only, **then CLOSE** the following valves: ___

– WDL-V-63 ___

– WDL-V-68 ___

5.7 **If** cleanup process was through “B” Precoat Filter only, **then CLOSE** the following valves: ___

– WDL-V-64 ___

– WDL-V-69 ___

5.8 **If** cleanup process was through “A” precoat filter and “A” Cation Demineralizer, **then CLOSE** the following valves: ___

– WDL-V-63 ___

– WDL-V-65 ___

– WDL-V-70 ___

5.9 **If** cleanup process was through “A” precoat filter and “B” Cation Demineralizer, **then CLOSE** the following valves: ___

– WDL-V-63 ___

– WDL-V-65 ___

– WDL-V-67 ___

– WDL-V-71 ___

5.10 **If** cleanup process was through “A” precoat filter and <u>both</u> Cation Demineralizers, **then CLOSE** the following valves: ___

– WDL-V-63 ___

– WDL-V-65 ___

– WDL-V-67 ___

– WDL-V-70 ___

– WDL-V-71 ___

5.11 **If** cleanup process was through “B” precoat filter and “B” Cation Demineralizer, **then CLOSE** the following valves: ___

– WDL-V-64 ___

– WDL-V-66 ___

– WDL-V-71 ___

5.12 **If** cleanup process was through “B” precoat filter and “A” Cation Demineralizer, **then CLOSE** the following valves: ___

– WDL-V-64 ___

– WDL-V-66 ___

– WDL-V-67 ___

– WDL-V-70 ___

5.13 **If** cleanup process was through “B” precoat filter and both Cation Demineralizers, **then CLOSE** the following valves: ___

– WDL-V-64 ___

– WDL-V-66 ___

– WDL-V-67 ___

– WDL-V-70 ___

– WDL-V-71 ___

5.14 **CLOSE** the following valves: ___

– DH-V-28 ___

– SF-V-40 ___

– SF-V-43 ___

– SF-V-45 ___

NOTE: Performance of the following steps in order will ensure a vent path exists and prevent hydraulic locking of large diaphragm operated valves such as SF-V-20.

5.15 **CLOSE** SF-V-19. ___

5.16 **OPEN** SF-V-42. ___

5.17 **CLOSE** SF-V-20. ___

5.18 **CLOSE** SF-V-36. ___

5.19 **CLOSE** SF-V-42. ___

NOTE: The same PPC point that was used to determine initial BWST level should be used in the following step.

5.20 **RECORD** final BWST level, and PPC point used to determine level. ___

Final BWST Level	PPC Point Used (Circle)
	A0486 A0487

5.21 **CALCULATE** BWST level change by subtracting Final BWST Level from Initial BWST Level. ___

_____ - _____ = _____
Initial BWST Level Final BWST Level BWST Level Change

5.22 **If** the absolute value of BWST Level Change is greater than 0.1 feet, **then** perform the following: ___

1. **VERIFY** TS 3.3.1.1.a (BWST volume) **and** TS 3.3.1.3.b (NaOH Tank / BWST differential level) requirements continue to be met. ___
2. **INITIATE** an IR to investigate cause of BWST level change. ___

6.0 REFERENCES

6.1 1104-29C, Spent Fuel Cleanup Processes, Rev. 32 Section 5.0

7.0 ATTACHMENTS

7.1 Device Locator List

ATTACHMENT 7.1
Device Locator List
Page 1 of 2

DEVICE	DESCRIPTION	ELEV	BLDG	AREA
CA-P-5A-EX4	CA-P-5A LOCAL CONTROL	305	AB	Precoat Panel
CA-P-5B-EX4	CA-P-5B LOCAL CONTROL	305	AB	Precoat Panel
CA-V-145A-EX4	CA-V-145A LOCAL CONTROL	305	AB	Precoat Panel
CA-V-145B-EX4	CA-V-145B LOCAL CONTROL	305	AB	Precoat Panel
CA-V-202A-EX7	CA-V-202A CONTROL SWITCH	305	AB	Precoat Panel
CA-V-202B-EX7	CA-V-202B CONTROL SWITCH	305	AB	Precoat Panel
DH-V-28	BWST Cleanup Return From SF Cooling	305	Yard	1' East of BWST, 4' South of 24" Discharge Line
SF-P-2-EX7	SF-P-2 Pistol Grip Ctl Sw (NSP,NST,PTL)	305	AB	Radwaste Panel
SF-V-18	SF Pumps Suct Isolation Vlv From BWST	281	AB	North of Elevator, West Wall
SF-V-19	SF-DHR X-Conn Isol Valve	281	AB	North of Elevator, West Wall
SF-V-20	SF Syst To BWST Isolation Valve	281	AB	North of Elevator, West Wall
SF-V-21	SF/FTC Isol Valve	281	AB	North of Elevator, West Wall
SF-V-35	SF-P2 Suct Vlv From Spent Fuel Cask Pit	281	AB	North of Elevator, West Wall
SF-V-36	SF-P2 Suct Vlv From BWST Tank	281	AB	North of Elevator, West Wall
SF-V-37	SF-P-2 Suct Vlv From Fuel Pool A & B	281	AB	North of Elevator, West Wall
SF-V-40	**SF-P-2 Disch Isol Vlv to LWDS**	**281**	**AB**	**North of Elevator, West Wall**
SF-V-41	SF-P-2 Disch Isol Vlv To A SF Pool	281	AB	North of Elevator, West Wall
SF-V-42	SF-P-2 Disch Isol Vlv To SF Fuel Cask Pit	281	AB	North of Elevator, West Wall
SF-V-43	LWDS To Spent Fuel Syst Isol Valve	281	AB	North of Elevator, East Wall
SF-V-44	SF System Isol Valve To DH-P-1A Suct	281	AB	North of Elevator, East Wall
SF-V-45	SF System Isolation Valve To BWST	281	AB	North of Elevator,

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ATTACHMENT 7.1
Device Locator List

DEVICE	DESCRIPTION	ELEV	BLDG	AREA
				East Wall

ATTACHMENT 7.1
Device Locator List
Page 2 of 2

DEVICE	DESCRIPTION	ELEV	BLDG	AREA
SF-V-46	LWDS Purif Line To A Spent Fuel Pool	281	AB	North of Elevator, East Wall
SF-V-47	LWDS Purif Line To B Spent Fuel Pool	281	AB	North of Elevator, East Wall
SF-V-49	SF-P-2 Priming Line Isol Vlv	281	AB	North of Elevator, West Wall
WDL-FR-126	PRECOAT FILTER A/B INLET FLOW RECORDER	305	AB	Precoat Panel
WDL-V-63-EX7	WDL-V-63 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel
WDL-V-64-EX7	WDL-V-64 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel
WDL-V-65-EX7	WDL-V-65 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel
WDL-V-66-EX7	WDL-V-66 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel
WDL-V-67-EX7	WDL-V-67 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel
WDL-V-68-EX7	WDL-V-68 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel
WDL-V-69-EX7	WDL-V-69 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel
WDL-V-70-EX7	WDL-V-70 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel
WDL-V-71-EX7	WDL-V-71 Control Pushbutton (Open/Closed)	305	AB	Radwaste Panel

ATTACHMENT 3

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

PROPOSED MARK-UP PROCEDURE
OP-TM-AOP-003, "EARTHQUAKE"

EARTHQUAKE

1.0 ENTRY CONDITIONS

Any of the following:

- Yellow EVENT indicator Lit on front panel of Strong Motion Accelerometer System (CR).
- PRF-1-2, “Threshold Seismic Condition” actuated.
- Red OBE indicator Lit on front panel of Strong Motion Accelerometer System (CR).
- PRF-1-3, “Operating Basis Earthquake” actuated.
- Ground motion felt by station personnel.

2.0 IMMEDIATE ACTIONS

None

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3.0 FOLLOW-UP ACTIONS

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
___ 3.1 **ANNOUNCE** entry into OP-TM-AOP-003, "Earthquake," over the plant page **and** radio.	
☐ 3.2 **IAAT** an Operating Basis Earthquake (OBE) has occurred **or** plant damage levels warrant a plant shutdown, **then** perform the following: ___ 1. **INITIATE** a plant shutdown IAW 1102-4, "Power Operation" **and** 1102-10, "Plant Shutdown". ___ 2. **INITIATE** 1102-11, "Plant Cooldown".	___ 1. **TRIP** the reactor **and INITIATE** EOP-001.
___ 3.3 **EVALUATE** Emergency Action Levels (EALs).	
3.4 If BWST is on Clean up IAW OP-TM-212-501 or Recirc IAW OP-TM-212-252 Section 4.2, then PERFORM the following: **___ 1. STOP SF-P-2** **___ 2. CLOSE SF-V-43** **___ 3. CLOSE SF-V-40** **___ 4. CLOSE SF-V-20** **___ 5. CLOSE SF-V-45**	
☐ 3.5 **IAAT** an event at **or** above the Threshold Seismic Condition (TSC) has occurred, **GO TO** Step 3.8.	

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CARRY-OVER STEPS	
Condition	**Step**
An OBE has occurred **or** plant damage levels warrant a shutdown	3.2
An event at **or** above the Threshold Seismic Condition (TSC) has occurred	3.5

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ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
___ 3.6 **If** <u>both</u> of the following conditions exist**:** – Seismic instrumentation is inoperable **or** does **<u>not</u>** indicate a seismic event. – A seismic event is felt by on-site personnel. **then PERFORM** Attachment 1, Seismic Instrumentation Inoperable.	
___ 3.7 **If** <u>either</u> of the following conditions exist:	

<u>NOTE</u>

Following an Operating Basis Earthquake (OBE), the OBE indicator and PRF-1-3 will **<u>not</u>** actuate until recording is complete (possibly several minutes after the event).

– EVENT **or** OBE indicator Lit on seismic instrumentation. – PRF-1-2 **or** PRF-1-3 Actuated. **then PERFORM** Attachment 2, Determining Validity of Seismic Instrumentation/Alarms.	
___ 3.8 **If** a TSC **or** OBE has been declared, **then PERFORM** Attachment 3, Actions for a Valid Seismic Condition.	
___ 3.9 **GO TO** Section 4.0, “Return To Normal”.	

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4.0 RETURN TO NORMAL

NOTE: The following steps may be performed in any order or concurrently.

1. **If** the earthquake magnitude was determined to be less than a Threshold Seismic Condition, **then NOTIFY** the PDMS Manager that no response is required. ___

2. **If** the Technical Support Center (TSC) was activated, **then OBTAIN** recovery directions from the TSC. ___

3. **If** an earthquake was determine to have occurred, **then NOTIFY** I&C to perform the following Appendices of 1105-17, Earthquake Monitoring System: ___

   – Appendix 1, Backup Of Recorded Events ___

   – Appendix 2, Retrieval and Processing of PRA Erasure Tape ___

4. **If** the seismic event exceeded the OBE criteria, **then** perform the following prior to plant restart (based on the results of the restart walkdown required by Step 4.15.2 of Attachment 3): ___

   – **OBTAIN** concurrence from the Plant Manager. ___

   – **OBTAIN** permission from the NRC. ___

5. Perform the following to reset TSC and OBE alarms:

   1. **PRESS** RESET on the Strong Motion Accelerometer System (CR). ___

   2. **ENSURE** PRF-1-2 and PRF-1-3 are clear. ___

5.0 ATTACHMENTS

Attachment 1, Seismic Instrumentation Inoperable

Attachment 2, Determining Validity of Seismic Instrumentation/Alarms

Attachment 3, Actions for a Valid Seismic Condition

Attachment 4, Criteria For SSE Exceedance

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ATTACHMENT 1
Seismic Instrumentation Inoperable
Page 1 of 3

1.0 PURPOSE

To confirm and classify a seismic event in the absence of installed seismic instrumentation/alarms.

2.0 MATERIAL AND SPECIAL EQUIPMENT

None

3.0 PRECAUTIONS, LIMITATIONS, AND PREREQUISITES

3.1 Precautions:

None

3.2 Limitations:

None

3.3 Prerequisites:

None

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ATTACHMENT 1
Seismic Instrumentation Inoperable
Page 2 of 3

4.0 MAIN BODY

4.1 **CONTACT** the U.S. Geological Survey's National Earthquake Center (USGS) to confirm the earthquake (303-273-8500). ___

4.2 **If** the earthquake is confirmed, **then** perform the following: ___

1. **RECORD** the following from the Earthquake Center:

   – Epicenter Location: _____
   (latitude & longitude)

   _____
   (nearest town & state)

   – Magnitude: _____ (Richter scale)

2. **If** it is determined that a nearby nuclear site is closer to the epicenter, **then** perform the following: ___

   A. **CONTACT** that facility (using an applicable phone number below), **and OBTAIN** the seismic data from their instrumentation. ___

Facility	Phone numbers (Ops Support Mgr / SM / CRS)
Peach Bottom	(717) 456-3477 / 4687 / 4223
Limerick	(610) 718-2840 / 2128 / 2125
Salem – Hope Creek	(856) 339-2636 / 5200 / 5201 (5202)
Susquehanna	(570) 542-3907 / 1971 / 3903
Beaver Valley	(724) 682-5198 / 5302 (5102) / 5110 (5313)

   B. **USE** the alternate site's seismic data (if available) to determine **and** declare the earthquake classification (OBE or TSC). ___

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ATTACHMENT 1
Seismic Instrumentation Inoperable
Page 3 of 3

4.2 (Continued)

3. **If** data from a closer nearby site can **not** be used, **then** perform the following: ___

   A. **If** the earthquake had a magnitude ≥ 6.0 (Richter Scale), **then DECLARE** an OPERATING BASIS EARTHQUAKE (OBE) has occurred. ___

   B. **If** the earthquake was ≥ 5.0 but < 6.0 (Richter Scale), **then** perform the following: ___

   NOTE: If required, TMI's location, (40° 9' 14.17"N, 76° 43' 30.69"W), can be used to determine the distance to the earthquake epicenter. This can be performed by the USGS Earthquake Center staff or by using internet web sites (such as Google Earth).

   1) **DETERMINE** the distance from TMI to the epicenter (using any available means). ___

   2) **If** the earthquake was within 125 miles of TMI, **then DECLARE** an OPERATING BASIS EARTHQUAKE (OBE) has occurred. ___

4. **If** data from a closer nearby site can **not** be used **and** an OBE has **not** occurred, **then DECLARE** a THRESHOLD SEISMIC CONDITION (TSC) has occurred. ___

5.0 RETURN TO NORMAL

None

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ATTACHMENT 2
Determining Validity of Seismic Instrumentation/Alarms
Page 1 of 4

1.0 PURPOSE

To determine the validity of a seismic instrument alarm.

2.0 MATERIAL AND SPECIAL EQUIPMENT

None

3.0 PRECAUTIONS, LIMITATIONS, AND PREREQUISITES

3.1 Precautions:

None

3.2 Limitations:

None

3.3 Prerequisites:

None

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ATTACHMENT 2
Determining Validity of Seismic Instrumentation/Alarms
Page 2 of 4

4.0 MAIN BODY

NOTE: The steps of this section may be performed in any order or concurrently.

4.1 **EVALUATE** Seismic Monitor computer printouts using Figures 1 **and** 2 of this Attachment. ___

4.2 **If** the Control Room staff did **not** feel ground motion, **then CONTACT** Security **or** other station personnel for reports of ground motion. ___

4.3 **CONTACT** one of the following for an independent confirmation of earthquake intensity:

– Peach Bottom Atomic Power Station (717-456-4687/4221) ___

– Limerick Generating Station (610-718-2125) ___

– National Earthquake Center (303-273-8500) ___

4.4 **If** the seismic monitor printouts indicate an OBE has occurred **and** the earthquake is confirmed by either of the following:

– Felt by station personnel,

– Independently confirmed by any of the facilities in Step 4.3 above,

then DECLARE an OPERATING BASIS EARTHQUAKE (OBE) has occurred. ___

4.5 **If** the seismic monitor printouts indicate an OBE has **not** occurred **but** the earthquake is confirmed by either of the following:

– Felt by station personnel

– Independently confirmed by any of the facilities in Step 4.3 above

then DECLARE a THRESHOLD SEISMIC CONDITION (TSC) has occurred. ___

5.0 RETURN TO NORMAL

None

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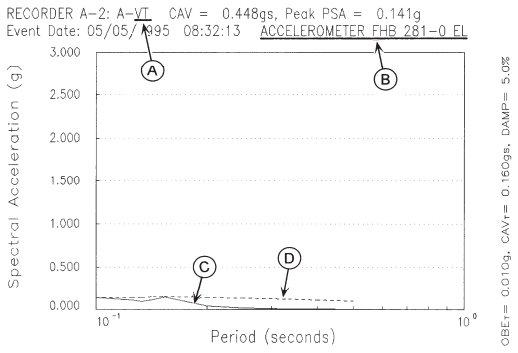
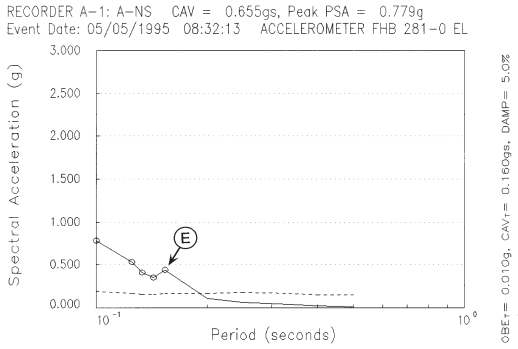
ATTACHMENT 2
Determining Validity of Seismic Instrumentation/Alarms
Page 3 of 4

FIGURE 1
Typical Seismic Event Printout

EXAMPLE OF OBE NOT EXCEEDED PLOT



EXAMPLE OF OBE AND SSE EXCEEDED PLOT



(A) Direction of motion. VT=vertical NS=north-south EW=east-west
(B) Accelerometer location.
(C) Plot of seismic event.
(D) OBE setpoint line.
(E) Circles indicate where OBE setpoint line was exceeded.

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ATTACHMENT 2
Determining Validity of Seismic Instrumentation/Alarms

FIGURE 2

NOTE

1. There will be two separate printouts of this chart, one for each triaxial accelerometer.
2. An alarm is VALID if two or more channels have at least one measurement exceeding 0.010g.
3. An alarm is potentially VALID if one channel has a measured value of ≥ 0.010g, and any other channel has measurements approaching 0.010g.
4. If only one channel shows any significant measurements, (as in the example below), the alarm is **not** VALID and is likely due to induced electrical noise.
5. OBE criteria is: At least one measurement in any frequency in any channel exceeds design, and at least 1 measurement in any other frequency in any other channel exceeds 2/3 design.

RESPONSE SPECTRA ANALYSIS FOR SSA-3 RECORDER B (S/N 31272)
EVENT DATE: 04/11/1999 16:29:51 ACCELEROMETER RB 455-8 EL
SELECTED EXCEEDANCE CRITERIA: NONE

CHANNEL 1: B-NS
Computed CAV = 0.000 g - s, CAV Design Limit = 0.160 g – s, OBE Limit Value = 0.010 g, Damping = 0.050
Spectral acceleration exceeded OBE design criteria at 0 periods
Spectral acceleration greater than 2/3 OBE design criteria at 0 periods

CHANNEL 2: B-VT
Computed CAV = 0.001 g - s, CAV Design Limit = 0.160 g – s, OBE Limit Value = 0.010 g, Damping = 0.050
Spectral acceleration exceeded OBE design criteria at 0 periods
Spectral acceleration greater than 2/3 OBE design criteria at 0 periods

CHANNEL 3: B-EW
Computed CAV - 0.000 g - s, CAV Design Limit = 0.160 g – s, OBE Limit Value = 0.010 g, Damping = 0.050
Spectral acceleration exceeded OBE design criteria at 0 periods
Spectral acceleration greater than 2/3 OBE design criteria at 0 periods

**** OBE CRITERIA WAS NOT EXCEEDED ****

OBE Design Values vs. Measured OBE Values (Units = g)
***indicates OBE design exceeded, + indicates > 2/3 OBE design value**

Period	Channel 1		Channel 2		Channel 3		Channel 4
[sec]	Design	Meas.	Design	Meas.	Design	Meas.	Unused
0.100	0.250	0.001	0.260	0.040	0.270	0.004	
0.125	0.350	0.001	0.200	0.032	0.360	0.001	
0.133	0.380	0.001	0.190	0.030	0.380	0.001	
0.143	0.400	0.001	0.190	0.029	0.420	0.001	
0.154	0.400	0.001	0.180	0.027	0.480	0.001	
0.200	1.060	0.001	0.160	0.020	1.190	0.001	
0.250	1.130	0.001	0.130	0.016	1.160	0.001	
0.333	0.600	0.000	0.120	0.012	0.530	0.000	
0.400	0.370	0.000	0.120	0.010	0.350	0.000	
0.500	0.250	0.000	0.100	0.008	0.230	0.000	

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ATTACHMENT 3
Actions for a Valid Seismic Condition
Page 1 of 3

1.0 PURPOSE

To provide the actions required to respond to a valid seismic condition.

2.0 MATERIAL AND SPECIAL EQUIPMENT

None

3.0 PRECAUTIONS, LIMITATIONS, AND PREREQUISITES

3.1 Precautions:

None

3.2 Limitations:

None

3.3 Prerequisites:

None

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ATTACHMENT 3
Actions for a Valid Seismic Condition
Page 2 of 3

4.0 MAIN BODY

4.1 **VERIFY** performance of this procedure has resulted in the declaration of an Operating Basis Earthquake (OBE) **or** a Threshold Seismic Condition (TSC). ___

NOTE: The remaining Steps of this section may be performed in any order or concurrently.

4.2 **If** the earthquake **or** plant damage was severe enough to have potentially caused unreported personnel injury, **then** perform either **or** both of the following: ___

– **DISPATCH** Security **and** other available personnel to search for victims. ___

– **PERFORM** personnel assembly/accountability. ___

4.3 **INITIATE** OP-TM-108-111-1001, "TMI Severe Weather and Site Inaccessibility Guidelines." ___

4.4 **INITIATE** OP-AA-108-111-1001, "Severe Weather and Natural Disaster Guidelines." ___

NOTE: The intent of Step 4.5 is to determine the effects of the earthquake on SSCs. This information is needed to determine if the plant can continue to operate or should be shutdown for additional inspections.

4.5 **If** the plant is in operation, **then INITIATE** a visual inspection of all accessible areas of the plant IAW EPRI NP-6695, "Guidelines for Nuclear Power Plant Earthquake Response." ___

4.6 **NOTIFY** the PDMS Manager to perform the following:

– Inspect TMI-2 for damage. ___

– Initiate 2301-1.1, "TMI-2 Reactor Vessel Fuel Removal/Rearrangement". ___

4.7 **ENSURE** the BWST is **not** on cleanup IAW OP-TM-212-501 **"Cleanup of the BWST" or Recirc IAW OP-TM-212-252 Section 4.2** ___

4.8 **ENSURE no** releases in progress. ___

Proposed revision to support BWST Cleanup and Recirculation LAR.

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ATTACHMENT 3
Actions for a Valid Seismic Condition
Page 3 of 3

4.9 **If** any of the following:
- Spent Fuel Pool Temperature (A0419 **or** A0420) is >160°F
- Spent Fuel Pool Level is < 343'6" (PLB-2-9 **or** PLB-2-10 in alarm)
- Spent Fuel Pool Temperature and/or level is unknown,

then INITIATE OP-TM-AOP-035, Loss of Spent Fuel Pool Cooling. ___

4.10 **If** there is steam leakage in the Auxiliary Building, **then ENSURE** the following are Closed: ___
- AS-V-17 (TB 355: W of 8B heater 7 ft up). ___
- EX-V-23 (TB 355: S end of AB steam header). ___

4.11 **If** ISPH ventilation is lost, **then INITIATE** OP-TM-535-901, "Emergency Ventilation of Screen House". ___

4.12 **If** DG Building ventilation is lost, **then INITIATE** the following for the affected building: ___
- OP-TM-861-910, "Emergency Ventilation of EG-Y-1A Room" ___
- OP-TM-861-911, "Emergency Ventilation of EG-Y-1B Room" ___

4.13 **If** Control Building ventilation is lost, **then INITIATE** OP-TM-AOP-034, "Loss of Control Building Cooling". ___

4.14 **If** EFW Pump Room ventilation is degraded, **then EVALUATE** the recommendations of SA-AA-111, "Heat Stress Control". ___

4.15 **If** OBE limits have been exceeded, **then** perform the following: ___

1. **INITIATE** inspection of the Spent Fuel Pool "A" racks to verify rack-to-rack **and** rack-to-wall gaps are maintained. ___
2. **When** the plant is shutdown, **then** perform the following: ___
   - **INITIATE** the post-shutdown plant inspections and tests IAW EPRI NP-6695, "Guidelines for Nuclear Power Plant Earthquake Response." ___
   - **INITIATE** OTSG inspection per EP-AP-420-003, "TMI Unit 1: Steam Generator Eddy Current Activities." ___
3. **DETERMINE** if the SSE criteria was exceeded using Attachment 4. ___

5.0 RETURN TO NORMAL

None

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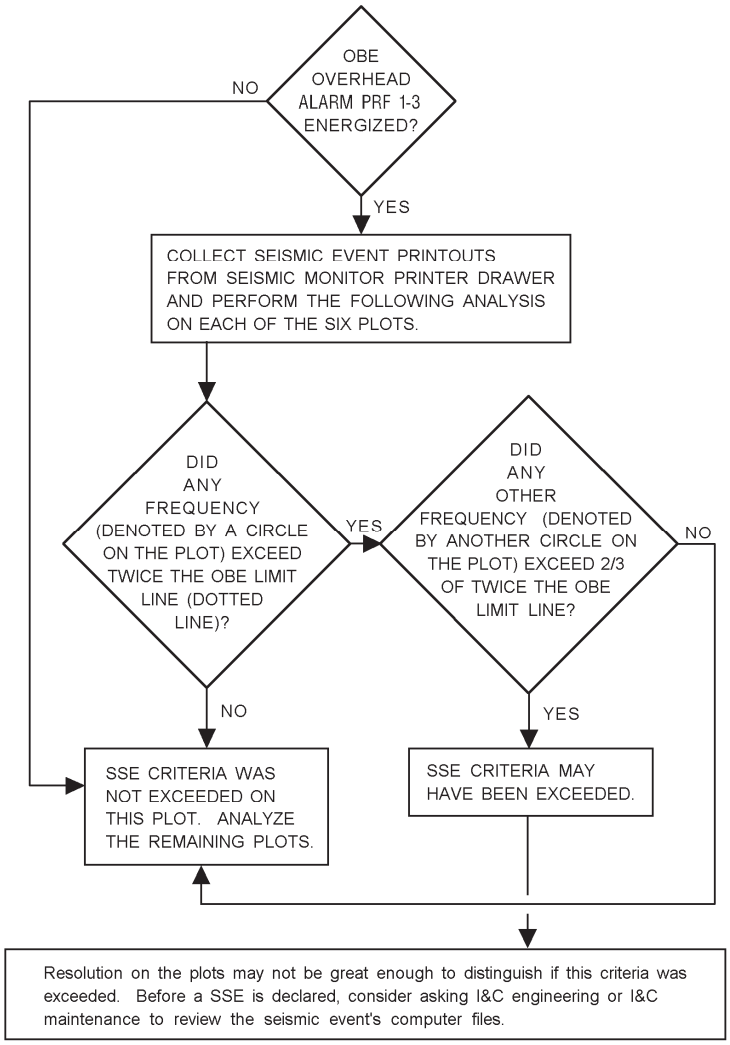
ATTACHMENT 4
Criteria for SSE Exceedance
Page 1 of 1



ATTACHMENT 4

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

PROPOSED MARK-UP PROCEDURE OP-TM-AOP-0031, "EARTHQUAKE BASIS DOCUMENT"

EARTHQUAKE BASIS DOCUMENT

1.0 DESIGN OR LICENSING BASIS REQUIREMENTS

1.1 UFSAR:

1.1.1 Section 2.8.1 states:

The conservative estimate of the maximum earthquake intensity to be expected at the site is a low intensity VI. Using relationships published in Reference 2.1, this intensity corresponds to a ground acceleration of 0.04g. The design is conservatively based on a basic ground motion of 0.06g.

1.1.2 Section 5.1.2.1 describes the design bases for Class I, II, and III structures, systems, and components (SSC), and includes the following definitions of the Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE):

OBE: *ground acceleration of 0.06g acting horizontally and 0.04g acting vertically and occurring simultaneously*

SSE: *ground acceleration of 0.12g acting horizontally and 0.08g acting vertically and occurring simultaneously*

1.1.3 Section 5.1.2.1.1.b states that a Class I design ensures that the stress resulting from an SSE *"has been limited so that the function of the structure is not impaired as to prevent a safe and orderly shutdown of the plant."*

1.1.4 Section 5.1.2.1.2.b states that a Class I design ensures that the stresses resulting from an SSE *"have been limited so that the function of the component, system, or structure is not impaired as to prevent a safe and orderly shutdown of the plant."*

1.1.5 Table 5.4.1 provides a listing of the Class I structures, systems, and components at TMI.

1.2 FHAR:

None

1.3 Technical Specifications:

1.3.1 Unit 2 Technical Specifications:

3.2.1.2 No more than 42 kg of fuel in the Reactor Vessel may be rearranged outside the geometry's analyzed in the Defueling Completion Report and the criticality safety analyses contained in GPU Nuclear letter C312-92-2080, dated December 18, 1992, without prior NRC approval.

1.3.2 Unit 1 Technical Specifications:

While there are numerous technical specifications that could potentially be affected due to damage sustained from an earthquake, there are no Unit 1 Technical Specifications directly relevant to seismic events or instrumentation or this procedure.

1.4 Critical Safety Function Review

1.4.1 CSF 1, Reactivity & Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability.

EARTHQUAKE: For all earthquakes at or below the Safe Shutdown Earthquake (SSE), all systems designed Class I (including those required for Reactivity and Reactor Power Control), remain operable. Earthquakes above the SSE are outside design basis events.

1.4.2 CSF 2, Reactor Vessel Inventory Control: Provide the means to maintain the core covered with sub cooled water.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I (including those required for Reactor Vessel Inventory Control), remain operable. Earthquakes above the SSE are outside design basis events.

1.4.3 CSF 3, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I (including those required for RCS Integrity), remain operable. Earthquakes above the SSE are outside design basis events.

1.4.4 CSF 4, Core Heat Removal: Provide the capability to remove core heat production at all times.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I (including those required for Core Heat Removal), remain operable. Earthquakes above the SSE are outside design basis events.

1.4.5 CSF 5, Containment Integrity: Provide means to prevent or minimize fission product release to the environment. (1) Maintain containment pressure below design and (2) Provide capability to isolate the containment when required.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I (including those required for Containment Integrity), remain operable. Earthquakes above the SSE are outside design basis events.

1.4.6 CSF 6, Radiation Control & Control Room Habitability: Monitor and control the release of radiation to the environment. Maintain access to critical plant equipment and use of the Control Room.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I (including those required for Radiation Control & Control Room Habitability), remain operable. Earthquakes above the SSE are outside design basis events.

1.4.7 CSF 7, Electrical Power: Provide electrical power as required to accomplish the other Critical Safety Functions. Provide AC and DC power for emergency equipment operation and instrumentation systems.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I (including those required for Electric Power), remain operable. Earthquakes above the SSE are outside design basis events.

1.4.8 CSF 8, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling & ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems and some containment isolation valves.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I (including those required for Auxiliary Emergency Systems), remain operable. Earthquakes above the SSE are outside design basis events.

1.4.9 CSF 9, Fire Protection & Remote Shutdown Capability: Maintain means to prevent, detect and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I (including those required for Remote Shutdown Capability), remain operable. Per A.4 and A.5 of Section 5.0 of the FHAR, TMI complies with the requirements that: 1) a single failure in the fire suppression system should not impair both the primary and backup fire suppression capability, and 2) failure of the fire suppression system should not incapacitate safety related systems or components. Earthquakes above the SSE are outside design basis events.

1.4.10 CSF 10, Chemistry Control: Provide the means to monitor and control primary and secondary water chemistry in order to ensure the long term reliability of plant systems and limit the potential release of radioactive materials.

EARTHQUAKE: For all earthquakes at or below the SSE, all systems designed Class I remain operable. The ability to operate non-seismic systems (such as primary and secondary sampling) may be lost. However, pressure boundaries of sample systems within the containment will remain intact. Earthquakes above the SSE are outside design basis events.

2.0 MITIGATION STRATEGY

Paragraph (V)(a)(2) of 10CFR100, Appendix A, Seismic And Geologic Siting Criteria For Nuclear Power Plants, requires that a nuclear power plant be shut down and inspected if an earthquake motion occurs at the site which exceeds the Operating Basis Earthquake (OBE). The principal concern associated with exceeding the OBE is potential damage which could preclude continued safe operation.

Per EPRI NP-6695, Guidelines for Nuclear Plant Response to an Earthquake, the objectives of an earthquake response are to:

1. Determine the immediate effects of an earthquake on the physical condition of the plant.

2. Determine if shutdown is appropriate based on the observed damage to the plant or because the OBE has been exceeded.

3. Determine the readiness of the plant to resume operation, if shutdown.

Since earthquake damage can range anywhere from none (or insignificant), to catastrophic, this procedure is designed to work in conjunction with the remainder of the EOP/AOP network to accomplish objectives 1 and sometimes 2 above. (i.e., Damage from a seismic event may result in plant symptoms - up to and including a plant trip - that require concurrent entry into appropriate abnormal/emergency procedure(s). For these cases, performance of the appropriate abnormal/emergency procedure(s) will resolve the situation(s) resulting from the damage that occurred. Absence of such damage-induced symptoms indicates less sustained or immediate damage, thus reducing the urgency of the response and allowing time for this AOP to carry out walkdown inspections to determine the extent of the damage.)

For objective 2, if the damage from the event does not result in an automatic or forced plant shutdown/trip, the procedure determines if an OBE was exceeded. If so, then plant shutdown for further inspection and tests is accomplished. If the OBE was not exceeded, and no significant damage was found during the walkdown inspections, then shutdown of the plant is not considered necessary.

Finally, if the plant is shutdown (either initially or as a result of the event), guidance is provided to determine restart readiness per objective 3.

3.0 SCOPE/ENTRY CONDITIONS

3.1 Entry Conditions:

Any of the following:

– Yellow EVENT indicator Lit on front panel of Strong Motion Accelerometer System (CR)

– PRF-1-2, “Threshold Seismic Condition” actuated

– Red OBE indicator Lit on front panel of Strong Motion Accelerometer System (CR)

– PRF-1-3, “Operating Basis Earthquake” actuated

– Ground motion felt by station personnel

This procedure is designed for entry during all modes of plant operation. The primary indications of a seismic event are the seismic monitoring system and it’s annunciators (PRF-1-2 and PRF-1-3). However, since the seismic monitoring system is not safety related, it may not be available to diagnose the event. Therefore, entry into this AOP is also made whenever station personnel feel ground motion.

If an event is not strong enough to be sensed by the installed instrumentation or felt by station personnel, then entry into this procedure is not required. This would include events reported by or from off-site sources, including the National Earthquake Center. However, since this procedure is structured to diagnose and categorize the event before taking any action, entry under any circumstances is acceptable, (such as when station personnel are unsure whether or not they felt an earthquake).

4.0 IMMEDIATE ACTIONS

None – Memorized operator response before accessing the procedure is not required to successfully mitigate this event.

5.0 FOLLOW UP ACTIONS

The primary function of this procedure is to evaluate seismic events in order to screen out false alarms and minor earthquakes with a magnitude less than the Threshold Seismic Condition. Seismic events that are not screened out are then classified to determine the appropriate response. (Screening is accomplished by using dual confirmation between internal, external, and National Earthquake center data. Classification is accomplished using site-specific data, [if available], or by making conservative estimates from off-site data.)

Once an earthquake is classified, the procedure implements the appropriate actions to inspect for and correct any damage, perform a shutdown/cooldown if necessary, and evaluate the plant for continued operation and/or restart.

Specific steps are discussed below.

Step Number	Discussion
Step 3.1	Entry into any EOP or AOP is announced to ensure all operators are aware of major changes in plant conditions. This action also makes chemistry, maintenance and radiation protection personnel aware.
Step 3.2	This continuous action step accomplishes the primary objective of this procedure which is to implement a plant shutdown and cooldown, if procedurally determined to be required. If plant damage from the earthquake allows, a controlled shutdown and cooldown is preferred, but provision is made to initiate and/or respond to a plant trip if required. (This step was placed as an IAAT early in the main text – instead of Attachment 3 – due to its importance.)
Step 3.3	This step initiates evaluation of the Emergency Action Levels (EALs). NOTE: The EAL criteria is slightly different from that in this AOP, in that the EAL classifications are solely based on functioning seismic instrumentation (with confirmation). The AOP goes beyond this limitation, and classifies the event regardless the seismic instrumentation status. Classification by the AOP will result in appropriate implementation of the EALs for either circumstance.
Step 3.4	**This step directs operator action if a seismic event occurs while the BWST is on cleanup IAW OP-TM-212-501 or Recirc IAW OP-TM-212-252 Step 4.2. This step is performed as a priority to isolate BWST cleanup in the event of a seismic event IAW TMI LAR TMI-15-071**
Step 3.5	This continuous action step directs the user to step 3.7 (for performance of Attachment 3), if it is determined that a TSC or greater even has occurred.

Proposed revision to support BWST Cleanup and Recirculation LAR.

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Step Number	Discussion
Step 3.6	This step directs the user to Attachment 1 if the plant seismic instrumentation or alarms are inoperable or did not respond to the event. (Thus, the only indication of the event would be that it was felt by station personnel.) Attachment 1 confirms and classifies the earthquake using sources external to the plant.
Step 3.7	This step directs the user to Attachment 2 if the plant seismic instrumentation did respond to the event. Attachment 2 confirms the earthquake using one additional source (either a nearby facility, the National Earthquake Center, or confirmation by station personnel). It then classifies the earthquake using information provided on the seismic instrumentation printout.
NOTE in step 3.7	This note is provided to alert the operator that a change in alarm status during procedure performance is a possibility, and does not necessarily indicate a new event that requires re-entry in the AOP.
Step 3.8	This step directs the user to Attachment 3 whenever it is determined that a TSC or greater earthquake has occurred. This Attachment is where the majority of the event response is performed.
Step 3.9	This is the end of the Follow Up actions of the main text and directs the user to Section 4.0.
Attachment 1	This attachment is entered for earthquakes that are felt by station personnel but where seismic instrumentation/alarms are not available or did not respond. It uses the National Earthquake Center both to confirm the earthquake and provide its epicenter location and magnitude (Richter scale). Once confirmed, it conservatively classifies the earthquake as either an OBE or TSC, (using the distance between the epicenter and TMI), via either of two methods: Method 1: If a nearby facility is determined to be closer to the epicenter, that facility is contacted and their seismic data is used to classify the earthquake. Method 2: If data from a nearby facility cannot be used, the earthquake's magnitude and distance from the plant are used. If the earthquake was over a 6.0 magnitude at any distance from the plant, or over 5.0 magnitude within 125 miles of TMI, then it is classified as an OBE. Otherwise, it is classified as a TSC. (per Appendix A of RG 1.66) Note that, since the earthquake was not alarmed, but rather felt and then confirmed, this attachment results in a declaration of either an OBE or TSC. This is necessary for adequate EAL classification, since their threshold values are based on an alarm and confirmation – which cannot occur if the instrumentation is OOS.

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Step Number	Discussion
Attachment 2	This attachment is entered for earthquakes that actuate the installed seismic instrumentation/alarms. It evaluates the earthquake using the information provided on seismic instrumentation printouts (with two figures provided as examples). It then confirms the earthquake using one additional source (either a nearby facility, the National Earthquake Center, or confirmation by station personnel). The classification can result in a TSC or OBE declaration, or, (in contrast to Attachment 1), no declaration at all.
Attachment 3	This attachment is entered whenever it is determined that a TSC or larger magnitude earthquake has occurred. This attachment contains the actions necessary to respond to a confirmed earthquake. The individual steps of this attachment are described below:
Attachment 3, Step 4.1	To prevent unnecessary performance of the included steps, the first step directs the user to verify that performance of this procedure has resulted in the declaration of either an Operating Basis Earthquake (OBE) or a Threshold Seismic Condition (TSC).
Attachment 3, Step 4.2 NOTE	This note informs the user that the remainder of the steps may be performed in any order or concurrently.
Attachment 3, Step 4.2	This step determines if the earthquake or damage was severe enough to have potentially caused personnel injury. It then takes action by dispatching personnel to search for victims or performing personnel assembly/accountability.
Attachment 3, Step 4.3	This step directs the user to initiate OP-TM-108-111-1001, TMI Severe Weather and Site Inaccessibility Guidelines. In case the earthquake affects access to the site, this procedure will provide adequate staffing for plant operations and E-Plan implementation while allowing unnecessary personnel to leave the site.
Attachment 3, Step 4.4	This step, (performed regardless of event classification or plant operating condition), directs the user to initiate OP-AA-108-111-1001, “Severe Weather and Natural Disaster Guidelines (per Action 2 of AR 00777761). The section for seismic event provides guidelines for walkdowns and plant inspections, using CC-AA-5001, Post Transient or Scram Walkdown, and ER-AA-330-004, Visual Examination of Snubbers, as applicable. The purpose of CC-AA-5001 is to identify any failures or degradation that could affect system operation and integrity. This will ensure deficiencies are identified and corrected. The purpose of ER-AA-330-004 is to inspect snubbers (in this case, following a potentially damaging transient event) to ensure deficiencies are identified and corrected.

Step Number	Discussion
Attachment 3, Step 4.5 and its NOTE	If the plant is in operation, this step, (in conjunction with the walkdowns from Step 4.4), implements the recommendations of EPRI NP-6695, "Guidelines for Nuclear Power Plant Earthquake Response, by walking down all accessible areas to determine if earthquake damage requires a plant shutdown, or if continued operation is allowed.
Attachment 3, Step 4.6	This step directs the user to notify the PDMS Manager to inspect TMI-2 for damage and to initiate 2301-1.1, "TMI-2 Reactor Vessel Fuel Removal/Rearrangement". (A valid seismic condition which triggers the U1 Earthquake Detection System is an entry condition to 2301-1.1) This ensures compliance with Unit 2 Technical Specification 3.2.1.2. **(CM-1)**
Attachment 3, Step 4.7	The step ensures the BWST is not on cleanup **IAW OP-TM-212-501 or Recirc IAW OP-TM-212-252 Step 4.2**. Since the **Spent Fuel** portion of the BWST piping **that is used for these evolutions** is not seismic, this minimizes the potential for loss of ECCS inventory.
Attachment 3, Step 4.8	The step ensures that **no** releases are in progress. Since portions of the release systems are non-seismic, this minimized the potential for undesired/unmonitored releases. (per Action 2 of AR 00730406 from operations review of SEN 269)
Attachment 3, Step 4.9	This step provides the action to be taken if the Spent Fuel Pool or the Spent Fuel Pool cooling system has been damaged. This step will also direct initiation of AOP-35 if the ability to monitor the Spent Fuel Pool has been lost.
Attachment 3, Step 4.10	This step ensures adequate isolation for any steam leakage into the Auxiliary Building.
Attachment 3, Step 4.11	This step provides the action to be taken if ISPH ventilation is lost.
Attachment 3, Step 4.12	This step provides the action to be taken if DG Building ventilation is lost.
Attachment 3, Step 4.13	This step provides the action to be taken if Control Building ventilation is lost.
Attachment 3, Step 4.14	If EFW Pump Room ventilation is degraded, this step evaluates the recommendations of SA-AA-111, "Heat Stress Control".

Proposed revision to support BWST Cleanup and Recirculation LAR.

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Step Number	Discussion
Attachment 3, Step 4.15	This step only applies if OBE limits were exceeded (thus requiring a plant shutdown). Substep 1 initiates an inspection to verify the rack-to-rack and rack-to-wall gaps are maintained in Spent Fuel Pool A. Substep 2 initiates the following when the plant is shutdown: • The post-shutdown plant inspections and tests IAW EPRI NP-6695, "Guidelines for Nuclear Power Plant Earthquake Response • OTSG inspection per EP-AP-420-003, TMI Unit 1: Steam Generator Eddy Current Activities Substep 3 determines if the SSE criteria was exceeded using Attachment 4, Criteria for SSE Exceedance
Attachment 4	This is a logic drawing that can be used to determine if the SSE criteria has been exceeded. It requires operability of the seismic instrumentation, (specifically the printout following an event), so may not be available in all cases. However, knowledge of SSE exceedence is only required for restart readiness evaluation, and is not, in any way, required for implementation of the response actions of this procedure.

6.0 RETURN TO NORMAL

RTN Step 4.1 NOTE	This note informs the user that the remainder of the steps may be performed in any order or concurrently.
RTN Step 4.1	If the earthquake was determined to be less than a Threshold Seismic Condition, then the PDMS Manager is notified that no action is required
RTN Step 4.2	If the Technical Support Center was activated, then recovery directions are obtained from the TSC. This will be the case for all earthquakes determined to have a magnitude at or above a Threshold Seismic Condition.
RTN Step 4.3	This step has I&C perform Appendix 1 and 2 of 1105-17 to backup the Strong Motion Accelerometer and to Retrieve and Process the PRA Erasure Tapes. The backup will provide a historical file. The PRA tapes will provide an independent measure of the peak accelerations for each of the three planes on the three installed peak reading accelerographs. (These devices provide actual peak readings regardless of the availability or actuation status of the seismic instrumentation.) This also installs new PRA tapes to allow collection of subsequent readings on any aftershocks. While not directly applicable to the immediate classification of the event, this information will be useful in the post-event analysis relating to restart readiness (particularly if the seismic instrumentation was inoperable

	during the event).
RTN Step 4.4	If the seismic event exceeded the OBE criteria, then the user is directed to obtain concurrence from the Plant Manager and the NRC prior to restart.
RTN Step 4.5	This step provides direction for resetting all alarms associated with a seismic event.

7.0 REFERENCES

7.1 Developmental References

7.1.1 1230-30, Earthquake, (R44)

7.1.2 EPRI NP-6695, Guidelines for Nuclear Plant response to an Earthquake

7.1.3 EPRI NP-5930, A Criterion for Determining Exceedance of the Operating Basis Earthquake

7.1.4 Unit 2 Technical Specification 3.2.1.2

7.1.5 RG 1.165, Identification And Characterization Of Seismic Sources And Determination Of Safe Shutdown Earthquake Ground Motion

7.1.6 RG 1.166, Pre-Earthquake Planning And Immediate Nuclear Power Plant Operator Post-earthquake Actions

7.1.7 RG 1.167, Restart Of A Nuclear Power Plant Shut Down By A Seismic Event

7.2 Implementing References

7.2.1 1102-4, Power Operation

7.2.2 1102-10, Plant Shutdown

7.2.3 1102-11, Plant Cooldown

7.2.4 1105-17, Earthquake Monitoring System

7.2.5 EOP-001, Reactor Trip Or Safety Injection

7.2.6 OP-TM-AOP-034, Loss of Control Building Cooling

7.2.7 OP-AA-108-111-1001, Severe Weather and Natural Disaster Guidelines

7.2.8 OP-TM-108-111-1001, TMI Severe Weather and Site Inaccessibility Guidelines

7.2.9 OP-TM-212-501, Cleanup of the BWST

7.2.10 OP-TM-535-901, Emergency Ventilation of Screen House

7.2.11 OP-TM-861-910, Emergency Ventilation of EG-Y-1A Room

7.2.12 OP-TM-861-911, Emergency Ventilation of EG-Y-1B Room

7.2.13 SA-AA-111, Heat Stress Control

7.2.14 EP-AP-420-003, TMI Unit 1: Steam Generator Eddy Current Activities

7.2.15 2301-1.1, TMI-2 Reactor Vessel Fuel Removal/Rearrangement

7.3 Commitment

7.3.1 **CM-1** Action Tracking Item AR00603573.28 License Renewal Structures Monitoring Program (Step 4.6 “Attachment 3”, OP-TM-AOP-003 Step 4.6).

8.0 VALIDATION

8.1 Scenario #1:

8.1.1 100% RTP, no OOS equipment. PRF 1-2, Threshold Seismic Condition actuates. Various high vibration alarms actuate, but clear when silenced. Various tank levels show oscillations. No other abnormalities are readily apparent. Report received from the field personnel that an earthquake occurred.

8.1.2 Three minutes after the event starts, PRF 1-3, Operating Basis Earthquake actuates and the crew is provided the seismic printout for Scenario #1. This printout should show that an OBE was exceeded. Fifteen minutes after the original earthquake, a slightly smaller aftershock occurs and re-alarms PRF 1-2.

8.2 Scenario #2:

8.2.1 100% RTP, the Strong Motion Accelerometer System is deenergized for maintenance. One or more control room staff “feel” an earthquake. Various tank levels show minor oscillations. No other abnormalities are readily apparent. Report received from the field personnel that we may have had an earthquake.

8.2.2 The National Earthquake Center reports that the magnitude was 5.7 and the location was 41°25’45”N by 74°30’40”W (5 miles W-SW of Middletown, NY) Susquehanna plant is determined to be the closest facility and reports that they did experience an earthquake, but it had a magnitude less than an OBE.

9.0 SETPOINTS

Procedural / Equipment Setpoints		
Parameter	**Value**	**Confirmation**
PRF-1-2, Threshold Seismic Condition (TSC)	0.01g	Confirmation via one of the following: • ”Felt” by station personnel • IV’d from an external source
PRF-1-3, Operating Basis Earthquake (OBE)	Calculated value, based on seismic spectra curve for TMI	Confirmation via one of the following: • ”Felt” by station personnel • IV’d from an external source
TSC with TMI seismic instrumentation inoperable & **other** site closer to epicenter	Anything below the OBE setpoints in use at the closer site	Confirmation: • “Felt” by station personnel
OBE with TMI seismic instrumentation inoperable & **other** site closer to epicenter	OBE setpoints in use at the closer site	Confirmation: • “Felt” by station personnel
TSC with TMI seismic instrumentation inoperable & **no** site closer to epicenter	Magnitude reported by the National Earthquake Center (NEC) < the OBE limits listed in the row below	Confirmation: • “Felt” by station personnel
OBE with TMI seismic instrumentation inoperable & **no** site closer to epicenter	Magnitude reported by NEC either: ≥ 6.0 (Richter Scale) at any distance from plant ≥ 5.0 (Richter Scale) within 125 miles of TMI	Confirmation: • “Felt” by station personnel
SSE based on TMI seismic instrumentation	Any frequency > twice the OBE limit (as shown on the seismic instrumentation printout)	Confirmation: • Any other frequency > 2/3 the OBE limit

TMI Design Data		
Parameter	**Value**	**Comment**
OBE	0.06g horizontal and 0.04g vertical	
Safe Shutdown Earthquake (SSE)	0.12g horizontal and 0.08g vertical	

10.0 EXIT CRITERIA

This AOP concludes at one of three end points, based on the severity of the earthquake:

1. Earthquake causing minimal damage and determined to be less than TSC; Unless the event caused an automatic shutdown, no plant manipulation is taken and no emergency action level is entered.

2. Earthquake causing minimal damage and determined to be $\geq$ TSC, but < OBE; Unless the event caused an automatic shutdown, plant operation remains in it's pre-earthquake condition. Unusual Event is declared and applicable actions are taken per Attachment 3.

3. Earthquake causing damage sufficient to warrant a shutdown or determined to be $\geq$ OBE; Plant is shutdown (or tripped). Alert is declared and all actions are taken per Attachment 3. Plant restart requires NRC concurrence.