Entergy

**Entergy Nuclear Operations, Inc.**
**Palisades Nuclear Plant**
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Covert, MI 49043
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**Anthony J. Vitale**
Site Vice President

PNP 2014-108

December 18, 2014

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

SUBJECT: Palisades Nuclear Plant 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

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

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 (Adams Accession No. ML12056A046).
2. NEI letter, *Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations*, dated April 9, 2013 (ADAMS Accession No. ML13101A379).
3. NRC letter, *Electric Power Research Institute Report XXXXXX, "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 Reevaluations*, dated May 7, 2013 (ADAMS Accession No. ML13106A331).
4. Electric Power Research Institute Report 3002000704, *Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic,* dated May 2013.

A010
NRR

Dear Sir or Madam:

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, with the remaining seismic hazard and screening information submitted by March 31, 2014. NRC agreed with that proposed path forward in Reference 3.

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 Palisades Nuclear Plant provides the information described in Section 7 of Reference 4 in accordance with the schedule identified in Reference 2.

This letter contains five new commitments, identified in the attachment.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 18, 2014.

Sincerely,

ajv/jse

Attachment: List of Regulatory Commitments

Enclosure: Expedited Seismic Evaluation Process (ESEP) Report for Palisades Nuclear Plant

cc: Director of Office of Nuclear Regulation
Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

**Attachment to**

**PNP 2014-108**

**List of Regulatory Commitments**

## List of Regulatory Commitments

The following table identifies those actions committed to by Entergy Nuclear Operations, Inc. (ENO) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

| COMMITMENT | TYPE (Check One) | | SCHEDULED COMPLETION DATE (If Required) |
|---|---|---|---|
| | ONE-TIME ACTION | CONTINUING COMPLIANCE | |
| 1. ENO will perform seismic walkdowns, generate High Confidence of a Low Probability of Failure calculations, and design and implement any necessary modifications for inaccessible items listed in Section 7.1 of the Expedited Seismic Evaluation Process (ESEP) Report for Palisades Nuclear Plant. | X | | No later than the end of the second planned refueling outage after December 31, 2014. |
| 2. Modify Boric Acid Storage Tank (T-53A) tank anchorage such that the High Confidence of a Low Probability of Failure (HCLPF) capacity is greater than the demand characterized by the Review Level Ground Motion (RLGM) Peak Ground Acceleration. | X | | No later than the end of the second planned refueling outage after December 31, 2014. |
| 3. Modify Boric Acid Storage Tank (T-53B) tank anchorage such that the HCLPF capacity is greater than the demand characterized by the RLGM Peak Ground Acceleration. | X | | No later than the end of the second planned refueling outage after December 31, 2014. |
| 4. Modify Primary Makeup Storage Tank (T-81) such that the HCLPF capacity is greater than the demand characterized by the RLGM Peak Ground Acceleration. | X | | No later than the end of the second planned refueling outage after December 31, 2014. |
| 5. Submit a letter to NRC summarizing the HCLPF calculation results of commitments 1, 2, 3, and 4, and confirming implementation of the plant modifications associated with commitments 1, 2, 3, and 4. | X | | Within 60 days following completion of Expedited Seismic Evaluation Process activities, including commitments 1, 2, 3, and 4. |

**Enclosure to**

**PNP 2014-108**

# Expedited Seismic Evaluation Process (ESEP) Report for Palisades Nuclear Plant

54 Pages Follow

AREVA

# AREVA Inc.

## Engineering Information Record

**Document No.:** 51 - 9231248 - 002

## Expedited Seismic Evaluation Process (ESEP) Report for Palisades Nuclear Plant

Safety Related? ☐ YES ☒ NO

Does this document establish design or technical requirements? ☐ YES ☒ NO

Does this document contain assumptions requiring verification? ☐ YES ☒ NO

Does this document contain Customer Required Format? ☒ YES ☐ NO

## Signature Block

| Name and Title/Discipline | Signature | P/LP, R/LR, A-CRF, A | Date | Pages/Sections Prepared/Reviewed/ Approved or Comments |
|---|---|---|---|---|
| Ogden Sawyer Engineering Supervisor | | LP | 12.10.14 | All |
| Alan Horn PRA Engineer | | P | 12/10/14 | Appendix A (Section 3.0 and Attachment A) |
| Bijan Mahnoori Project Engineer II | | LR | 12/10/14 | All |
| Grant Tinsley PRA Engineer | | R | 12-10-14 | Appendix A (Sections 3.0, and Attachment A) |
| Mark Stewart Engineer IV | | R | 12-11-2014 | Appendix A (Sections 6.0, 7.0, 8.0 and Attachment B) |
| Kevin Connell Engineering Manager | | A | 12/11/14 | All |
| Jennifer Butler Project Manager for Jeremy Rice | | A-CRF | 12/11/14 | Appendix A |

Note: P/LP designates Preparer (P), Lead Preparer (LP)
R/LR designates Reviewer (R), Lead Reviewer (LR)
A-CRF designates Project Manager Approver of Customer Required Format (A-CRF)
A designates Approver/RTM – Verification of Reviewer Independence

## Signature Block
(continued)

### Project Manager Approval of Customer References (N/A if not applicable)

| Name (printed or typed) | Title (printed or typed) | Signature | Date |
|---|---|---|---|
| Jennifer Butler<br>Jeremy Pickett for | Project Manager | | 12/11/14 |

## Record of Revision

| Revision No. | Pages/Sections/ Paragraphs Changed | Brief Description / Change Authorization |
|---|---|---|
| 000 | All | Initial release |
| 001 | Section 2.0<br><br>Appendix A – 2.0, 3.0, 3.1, 3.1.1, 3.1.3, 3.1.4, 3.1.6, 3.2, 4.2, 5.1, 5. 2, 6.1, 6.2, 6.3.1, 6.3.3, 6.4, 6.5, 6.6, 7.1, 7.2, 8.1, 8.2, 8.3, 8.4 and 9.0, Attachment A and Attachment B. | Section 2.0<br>• Updated References 1, 3, 4, 40, 47, 49 and 50<br>• Added References 5, 37, 38, 51, 52 and 57<br>Appendix A<br>• Sections 2.0, 3.0, 3.1, 3.1.1, 3.1.3, 3.1.4, 3.1.6, 3.2, 4.2, 5.1, 5. 2, 6.1, 6.2, 6.3.1, 6.3.3, 6.4, 6.5, 6.6, 7.1, 7.2, 8.1, 8.2, 8.3, 8.4 and 9.0 were modified to incorporate Entergy comments [57] on Revision 000 of the document.<br>• Attachment A – modified to incorporate Entergy comments [57] and to update with additional components based on new revision of supporting document.<br>• Attachment B – modified to incorporate Entergy comments, update HCLPF capacities based on new revisions of supporting calculations, and to update with additional components based on new revision of supporting document. |
| 002 | Section 2.0<br><br>Appendix A – 3.1.1, 6.5, 7.2, and 8.4, Attachment A and Attachment B | Section 2.0<br>• Added Reference 58<br>Appendix A<br>• Sections 3.1.1 6.5, 7.2, and 8.4 were modified to incorporate Entergy comments [58] on Revision 001 of the document<br>• Attachment A – modified to incorporate Entergy Comments [58].<br>• Attachment B – modified to incorporate Entergy Comments [58]. |
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## 1.0 DOCUMENTATION

Appendix A to this document contains the Expedited Seismic Evaluation Process (ESEP) Report for Palisades Nuclear Plant, and is presented in the customer-required format.

## 2.0 REFERENCES

References identified with an (*) are maintained within Palisades Nuclear Plant Records System and are not retrievable from AREVA Records Management. These are acceptable references per AREVA Administrative Procedure 0402-01, Attachment 8. See page 2 for Project Manager Approval of customer 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, NRC ADAMS Accession No. ML12053A340.
2. EPRI 3002000704, "Seismic Evaluation Guidance, Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," May 2013.
3. Entergy Letter to U.S. NRC, letter number PNP 2013-010, "Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," February 28, 2013, NRC ADAMS Accession No. ML13246A399.
4. Entergy Letter to U.S. NRC, Letter Number PNP 2014-011, "Palisades Nuclear Plant 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, NRC ADAMS Accession No. ML14059A078.
5. Entergy Letter to U.S. NRC, Letter Number PNP 2014-085, "Palisades Nuclear Plant 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, NRC ADAMS Accession No. ML14240A278.
6. *Entergy Document, Engineering Change EC-46465, "FLEX Basis."
7. *Entergy Drawing E0001, Sheet 1, Revision 83, "Single Line Meter & Relay Diagram 480V Motor Control Center Warehouse, WD 950."
8. *Entergy Drawing E0001, Sheet 3, Revision 4, "Plant Single Line Diagram, WD 950."
9. *Entergy Drawing E0008, Sheet 1, Revision 57, "Single Line Meter & Relay Diagram 125V DC 120V Instrument & Preferred AC, System WD 950."
10. *Entergy Drawing E0008, Sheet 2, Revision 55, Single Line Meter & Relay Diagram 125V DC 120V Instrument & Preferred AC, System WD 950."
11. *Entergy Drawing E0078, Sheet 2, Revision 18, "WRSGL Schematic Diagram."
12. *Entergy Drawing E0078, Sheet 2A, Revision 6, "WRSGL Schematic Diagram."
13. *Entergy Drawing E0082, Sheet 5, Revision 13, "Schematic Diagram Wide Range Pressurizer Level Indicator/Alarm Instrumentation."
14. *Entergy Drawing E0090, Sheet 5, Revision 14, "Schematic Diagram Boric Acid System Instrumentation."

15. *Entergy Drawing E0092, Revision 14, "Schematic Diagram Safety Injection Tank Level Indicator Alarm Instrumentation."

16. *Entergy Drawing M0201, Sheet 1, Revision 87, "Piping & Instrument Diagram, Primary Coolant System."

17. *Entergy Drawing M0201, Sheet 2, Revision 66, "Piping & Instrument Diagram, Primary Coolant System."

18. *Entergy Drawing M0202, Sheet 1, Revision 76, "Piping & Instrument Diagram, Chemical & Volume Control System."

19. *Entergy Drawing M0202, Sheet 1A, Revision 64, "Piping & Instrument Diagram, Chemical & Volume Control System."

20. *Entergy Drawing M0202, Sheet 1B, Revision 59, "Piping & Instrument Diagram, Chemical & Volume Control System."

21. *Entergy Drawing M0203, Sheet 1, Revision 48, "Piping & Instrument Diagram, Safety Injection, Containment Spray, Shutdown Cooling System."

22. *Entergy Drawing M0203, Sheet 2, Revision 27, "Piping & Instrument Diagram, Safety Injection, Containment Spray, Shutdown Cooling System."

23. *Entergy Drawing M0205, Sheet 2, Revision 69, "Piping & Instrument Diagram, Main Steam and Auxiliary Turbine Systems."

24. *Entergy Drawing M0208, Sheet 1B, Revision 37, "Piping & Instrument Diagram, Service Water System."

25. *Entergy Drawing M0220, Sheet 1, Revision 97, "Piping & Instrument Diagram, Make-up Domestic Water & Chemical Injection Systems."

26. *Entergy Drawing M0207, Sheet 1, Revision 91, "Piping & Instrument Diagram, Feedwater & Condensate System."

27. *Entergy Drawing M0207, Sheet 2, Revision 38, "Piping & Instrument Diagram, Auxiliary Feedwater System."

28. *Entergy Procedure Palisades EOP-3.0, Revision 16, "Station Blackout."

29. *Entergy Drawing E0364, Revision 9, "Conduit and Tray Miscellaneous Plans."

30. *Entergy Drawing E0618, Sheet 569, Revision 12, "Connection Diagram Junction Box J569."

31. *Entergy Drawing M0222, Sheet 2, Revision 29 (EC-47346), "Piping & Instrument Diagram, Miscellaneous Gas Supply Systems."

32. *Entergy Drawing M0218, Sheet 2, Revision 61, "Piping & Instrument Diagram, Htg. Vent. & Air Cond. Containment Building."

33. *Entergy Drawing E0005, Sheet 5B, Revision 12, "Single Line Meter & Relay Diagram 480 Volt Motor Control Centers, System WD 950."

34. *Entergy Drawing E0099 Sh. 5, Revision 10, "Schematic Diagram, Containment Building Instrumentation (Left Channel)."

35. *Entergy Drawing E0084 Sh. 6, Revision 14, "Schematic Diagram, Pressurizer Pressure Control and Measurement Channel Instrumentation."

36. *Entergy Drawing E0087, Sh. 6, Revision 10, "Schematic Diagram Level Indication and Alarm Indication."

37. *Entergy Drawing E0076, Sheet 4C, Revision 8, "Schematic Diagram Feedwater and Turbine Driver Instrumentation."

38. *Entergy Drawing E0226, Sheet 1B, Revision 6, "Schematic Diagram – Reactor Vessel Level Monitoring System (Left Channel)."

39. *"Palisades Nuclear Plant - Final Safety Analysis Report," Revision 31, Docket 50-255, September 2014.

40. Entergy Letter to U.S. NRC, letter number PNP 2014-033, "Palisades Nuclear Plant Seismic Hazard and Screening Report (CEUS Sites), 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," dated March 31, 2014, NRC ADAMS Accession No. ML14090A069.

41. *Entergy Technical Specification C-175(Q), Revision 6, "Requirements for Seismic Evaluation of Electrical and Mechanical Equipment."

42. EPRI-NP-6041-SL, "Methodology for Assessment of Nuclear Power Plant Seismic Margin," Revision 1, August 1991.

43. EPRI TR-103959, "Methodology for Developing Seismic Fragilities," July 1994.

44. NRC NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," June 1991.

45. *Entergy Document, "Palisades Nuclear Plant Individual Plant Examination of External Events (IPEEE)," Revision 1, May 1996.

46. 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.

47. 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, NRC ADAMS Accession No. ML14111A147.

48. EPRI 1025287, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic. Electric Power Research Institute," February 2013.

49. Nuclear Energy Institute (NEI), A. Pietrangelo, Letter to D. Skeen of the USNRC, "Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations," April 9, 2013, NRC ADAMS Accession No. ML13101A379.

50. NRC (E Leeds) Letter to NEI (J Pollock), "Electric Power Research Institute Final Draft Report xxxxx, "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 Reevaluations," May 7, 2013, NRC ADAMS Accession No. ML13106A331.

51. *Entergy Calculation EA-EC46465-05, "Anchorage Calculations for Electrical Panels EP-1901 and EP-2001," Revision 0.

52. *Entergy Document, EA-EC48188-02, "Seismic Bracing of Non-Q Block Wall – South Wall of Lube Oil Storage Room," Revision 0.

53. *Entergy Document EC54011, "Fukushima Seismic 2.1 – Expedited Seismic Evaluation Program (ESEP) Report – Owner Acceptance of Report and Background Documentation," the following AREVA documents are captured in the plant document management system:

    a. AREVA Document 51-9212955-007, "ESEP Expedited Seismic Equipment List (ESEL) – Palisades Nuclear Plant."

    b. AREVA Calculation 32-9227862-001, "Palisades ESEP HCLPF Calculation – Electrical Cabinet EC-02."

    c. AREVA Calculation 32-9227902-001, "Palisades ESEP HCLPF Calculation – 480V Load Center, EB-11."

    d. AREVA Calculation 32-9227941-001, "Palisades ESEP HCLPF Calculation – Horizontal Pump, P-55C."

    e. AREVA Calculation 32-9227961-001, "Palisades ESEP HCLPF Calculation – 125 VDC Main Station Batteries ED-01 and ED-02."

    f. AREVA Calculation 32-9228097-001, "Palisades ESEP HCLPF Calculation – 480V Motor Control Center, EB-01."

    g. AREVA Calculation 32-9228681-001, "Palisades ESEP HCLPF Calculation – Auxiliary Feedwater Controls, EJ-1051."

    h. AREVA Calculation 32-9229831-002, "Palisades ESEP HCLPF Calculation – Primary System Storage Tank, T-81."

    i. AREVA Calculation 32-9230336-001, "Palisades ESEP Screening of Lube Oil Storage Room South Block Wall."

    j. AREVA Calculation 32-9230249-003, Palisades ESEP HCLPF Calculation – Boric Acid Storage Tanks T-53A & T-53B."

    k. AREVA Calculation 32-9228279-002, "Palisades ESEP HCLPF Calculation – Block Wall, C-104.11Q."

    l. AREVA Calculation 32-9228841-001, "Palisades ESEP HCLPF Calculation – Block Walls C-107.16Q, C-107.17Q, and C-107.18Q."

The following references are AREVA references which were used as input for Appendix A.

54. AREVA Document 32-9223795-002, "Palisades ESEP Binning and Screening."

55. AREVA Document 51-9230420-001, "Input to Entergy ESEP Report Sections 2 and 3 for Palisades Nuclear Plant."

56. AREVA Document 51-9227749-000, "Input to Entergy ESEP Report Sections 4 and 5 for Palisades Nuclear Plant."

57. AREVA Document 51-9231028-001, "Input to Entergy ESEP Report Sections 6, 7, and 8 for Palisades Nuclear Plant."

58. AREVA Document 38-9232220-001, "Palisades Nuclear Power Plant ESEP Report Comment Resolution Form."

59. AREVA Document 38-9233072-000, "Palisades Nuclear Power Plant ESEP Report, Revision 001, Comment Resolution Form."

# APPENDIX A: EXPEDITED SEISMIC EVALUATION PROCESS (ESEP) REPORT FOR PALISADES NUCLEAR PLANT

**Note: Customer requested formatting begins on the following page.**

# EXPEDITED SEISMIC EVALUATION PROCESS (ESEP) REPORT FOR PALISADES NUCLEAR PLANT

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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 Palisades Nuclear Plant. The intent of the ESEP is to perform an interim action in response to the NRC's 50.54(f) letter 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 Electric Power Research Institute (EPRI) 3002000704, Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic [2].

The objective of this report is to provide summary information describing the ESEP evaluations and results. The level of detail provided in the 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.

## 2.0 BRIEF SUMMARY OF THE FLEX SEISMIC IMPLEMENTATION STRATEGIES

The Palisades Nuclear Plant FLEX strategies for Reactor Core Cooling and Heat Removal, Reactor Inventory Control, and Containment Function are summarized below. This summary is derived from the Palisades Nuclear Plant Overall Integrated Plan (OIP) in Response to the March 12, 2012, Commission Order EA-12-049 [3] as augmented by the second six-month Status Report [4], the third six-month Status Report [5] and the FLEX Basis Engineering Change (EC) [6].

During Phase 1 reactor core cooling and heat removal are achieved with feedwater supply to the steam generators using the Turbine-Driven Auxiliary Feedwater (TDAFW) pump aligned to take suction from the Condensate Storage Tank (CST) and heat removal using the Atmospheric Dump Valves (ADVs). Operation of the ADVs can be accomplished by local operation. Steam supply valves for the TDAFW pump and Auxiliary Feedwater (AFW) flow control valves to the steam generators are also required.

At approximately two (2) hours after the event starts, operators will initiate a controlled cooldown-depressurization by opening the ADVs. Decreasing the Primary Coolant System (PCS) pressure permits the Safety Injection Tanks (SITs) to provide injection of borated water to the PCS to make-up for volume shrinkage and any minor inventory losses.

Prior to depletion of the CST, the primary makeup storage tank will be cross-connected to the CST for additional water. The combined capacity of these tanks provides about eight (8) hours of steam generator feed.

The Phase 2 strategy involves switching steam generator feed to an on-site portable, diesel driven FLEX pump taking water directly from Lake Michigan and pumping it to the steam generators.

Reactor Coolant System (RCS) inventory control will use the installed charging pumps, powered by a portable FLEX diesel generator, with borated water for injection from the installed Concentrated Boric Acid Storage Tanks (CBASTs). Prior to depletion of the CBASTs, boric acid batching operations will begin using the installed boric acid batching tank.

Containment function is not challenged early in the event and no actions are required during Phase 1 or Phase 2. During Phase 3, the strategy involves use of Regional Response Center (RRC) equipment to provide containment cooling via the Service Water System and the Containment Air Coolers and Fans.

Necessary electrical components are outlined in the Palisades Nuclear Plant FLEX OIP submittal, Second Six-Month Status Report and FLEX Basis, and primarily entail 480 volt AC Motor Control Centers (MCCs), 125 volt DC MCCs, vital batteries, battery chargers, and 120 volt AC distribution panels. Other supporting components include monitoring instrumentation for core cooling, reactor coolant inventory, and containment integrity. The FLEX strategy includes operators shedding unnecessary DC loads to extend the battery life into Phase 2.

The figures provided in Attachment 3 of Reference [3] provide the conceptual FLEX flow paths for Palisades Nuclear Plant Phases 1, 2 and 3.

## 3.0 EQUIPMENT SELECTION PROCESS AND ESEL

The selection of equipment for the Expedited Seismic Equipment List (ESEL) followed the guidelines of EPRI 3002000704 [2]. The ESEL for Palisades Nuclear Plant is presented in Attachment A. Information presented in Attachment A is drawn from the following references [3], [4],[5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37], and [38].

### 3.1 Equipment Selection Process and ESEL

The selection of equipment to be included 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 Palisades Nuclear Plant OIP in Response to the March 12, 2012, Commission Order EA-12-049 [3], second six-month Status Report [4], third six-month Status Report [5], and the FLEX Basis Engineering Change [6]. These references provide the Palisades Nuclear Plant FLEX mitigation strategy and serve as the basis for 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 Palisades Nuclear Plant OIP, second six-month Status Report, and the FLEX Basis. 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, and containment integrity functions. The scope of the ESEL does not include Spent Fuel Pool (SFP) components since the SFP is excluded by EPRI 3002000704 [2]. Portable and pre-staged FLEX equipment (not permanently installed) are excluded from the ESEL per EPRI 3002000704.

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

1. The scope of components is limited to that 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 Palisades Nuclear Plant OIP, second six-month Status Report, third six-month Status Report, and the FLEX Basis Engineering Change.
2. The scope of components is limited to installed plant equipment, and FLEX connections necessary to implement the Palisades Nuclear Plant OIP, second six-month Status Report, third six-month Status Report, and FLEX Basis Engineering Change as described in Section 2 in this report.
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 guidance are:
   - Structures (e.g. containment, reactor building, control building, auxiliary building, etc.)
   - Piping, cabling, conduit, HVAC, and their supports
   - Manual valves, check 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 Palisades Nuclear Plant OIP [3], second six-month Status Report [4], third six-month Status Report [5] and FLEX Basis Engineering Change [6] to determine the major equipment involved in the FLEX strategies. Further reviews of plant drawings (e.g., Flow Diagrams 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) in branch circuits / branch lines off the defined strategy electrical or fluid flow path. Flow Diagrams were the primary reference documents used to identify mechanical components. The flow paths used for FLEX strategies were selected and specific components were identified using detailed equipment and instrument drawings, electrical schematics and one-line drawings, system descriptions, and design basis documents, as necessary.

Cabinets containing electrical equipment and instrumentation, which could be affected by earthquake motion and potentially impact the operation of equipment on the ESEL, are required to be included on the ESEL for evaluation.

For Phase 1, TDAFW is the primary path for core cooling. For Phase 2, a portable diesel-driven FLEX pump is used. For Phase 3, the RRC equipment is used to provide the power and pumps for core cooling and inventory control. An extensive relay evaluation was performed as part of the A-46 and IPEEE programs and after screening out relays for which relay chatter is not an issue, no bad actors were identified. In addition, due to the Extended Loss of AC Power (ELAP) from the BDBEE, without power, chatter of relays supporting higher voltage equipment will not result in any negative effects from energized relay seal-in or lock-out. Therefore, no relays were listed on the ESEL.

For each parameter monitored during the FLEX implementation, a single indication loop was selected for inclusion in the ESEL per EPRI 3002000704 [2]. For each parameter indication, the components along the flow path from measurement to indication were included, since any failure along the path would lead to failure of that indication. Components such as flow elements were considered as part of the piping and were excluded from the ESEL.

### 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. AFW trips)." To address this concern, the following guidance is applied in the Palisades Nuclear Plant ESEL for functional failure modes associated with power operated valves:

- Power operated valves that remain energized during the ELAP events (such as Direct Current (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 be added to the ESEL as these components provide completely passive locations for pulling or installing cables. No breaks or connections in the cabling were included in pull boxes. Pull boxes were considered part of conduit and cabling, which were excluded in accordance with EPRI 3002000704 [2].

### 3.1.4 Termination Cabinets

Termination cabinets necessary for FLEX Phase 2 and Phase 3 connections from FLEX components, 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 are addressed.

### 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 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 Palisades Nuclear Plant OIP, second six-month Status Report, third six-month Status Report, and the FLEX Basis Engineering Change as described in Section 2." Item 3 in Section 3.1 also 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 above 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 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 on the ESEL is part of the primary means of FLEX implementation. Therefore, no additional justification is required.

# 4.0 GROUND MOTION RESPONSE SPECTRUM (GMRS)

## 4.1 Plot of GMRS Submitted by the Licensee

The Safe Shutdown Earthquake (SSE) control point elevation is defined at the ground surface, in the free field [39]. Table 4-1 shows the GMRS acceleration for a range of frequencies [40]. The GMRS at the control point is shown in Figure 4-1.

**Table 4-1: GMRS for Palisades Nuclear Plant**

| Frequency (Hz) | GMRS (g) |
|---|---|
| 100 | 2.83E-01 |
| 90 | 2.87E-01 |
| 80 | 2.92E-01 |
| 70 | 2.99E-01 |
| 60 | 3.13E-01 |
| 50 | 3.41E-01 |
| 40 | 3.87E-01 |
| 35 | 4.13E-01 |

**Table 4-1: GMRS for Palisades Nuclear Plant (continued)**

| Frequency (Hz) | GMRS (g) |
|---|---|
| 30 | 4.46E-01 |
| 25 | 4.93E-01 |
| 20 | 5.11E-01 |
| 15 | 5.46E-01 |
| 12.5 | 5.43E-01 |
| 10 | 5.49E-01 |
| 9 | 5.59E-01 |
| 8 | 5.49E-01 |
| 7 | 5.08E-01 |
| 6 | 4.82E-01 |
| 5 | 4.66E-01 |
| 4 | 4.38E-01 |
| 3.5 | 4.16E-01 |
| 3 | 3.67E-01 |
| 2.5 | 3.07E-01 |
| 2 | 2.90E-01 |
| 1.5 | 2.25E-01 |
| 1.25 | 1.90E-01 |
| 1 | 1.49E-01 |
| 0.9 | 1.30E-01 |
| 0.8 | 1.11E-01 |
| 0.7 | 9.47E-02 |
| 0.6 | 7.97E-02 |
| 0.5 | 6.51E-02 |
| 0.4 | 5.21E-02 |
| 0.35 | 4.56E-02 |
| 0.3 | 3.91E-02 |
| 0.25 | 3.26E-02 |
| 0.2 | 2.60E-02 |
| 0.15 | 1.95E-02 |
| 0.125 | 1.63E-02 |
| 0.1 | 1.30E-02 |

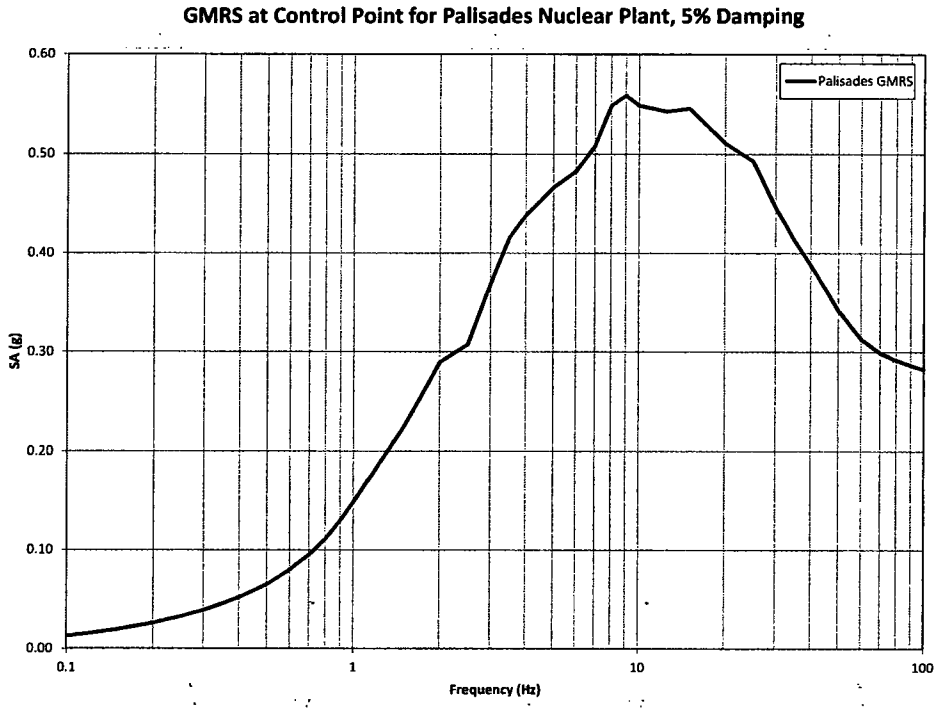


**Figure 4-1: GMRS for Palisades Nuclear Plant**

## 4.2 Comparison to SSE

The SSE is defined in the Final Safety Analysis Report [39] in terms of a Peak Ground Acceleration (PGA) and a design response spectrum. These spectra have been digitized and tabulated [40]. Table 4-2 shows the spectral acceleration values at selected frequencies for the 5% damped horizontal SSE.

**Table 4-2: SSE for Palisades Nuclear Plant**

| Frequency (Hz) | Spectral Acceleration (g) |
|---|---|
| 100 | 0.2 |
| 25 | 0.206 |
| 10 | 0.24 |
| 5 | 0.31 |
| 2.5 | 0.285 |
| 1 | 0.16 |
| 0.5 | 0.096 |

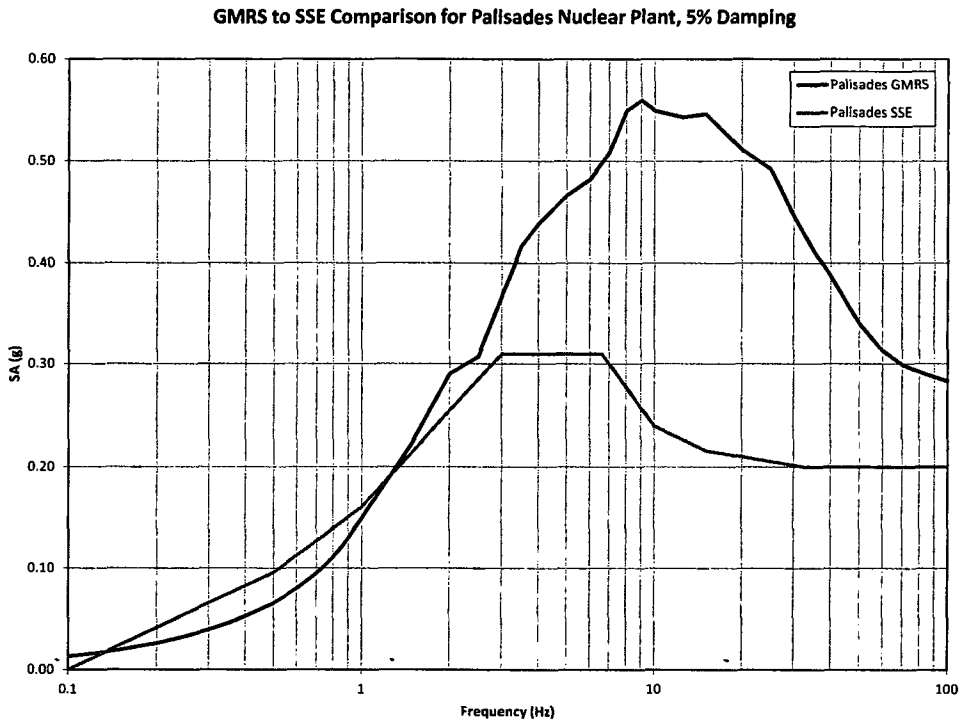


**Figure 4-2: GMRS to SSE Comparison for Palisades Nuclear Palisades**

The SSE envelops the GMRS in the low frequency range up to nearly 1.5 Hz. The GMRS exceeds the SSE beyond that point. As the GMRS exceeds the SSE in the 1 to 10 Hz range, the plant does not screen out of the ESEP according to Section 2.2 of EPRI 3002000704 [2]. The two special screening considerations as described in Section 2.2.1 of EPRI 3002000704, namely a) Low Seismic Hazard Site and b) Narrow Band Exceedances in the 1 to 10 Hz range, provide criteria for accepting specific GMRS exceedances. However, the GMRS exceedances are not limited to the low frequency range and there are no narrow-banded exceedances. Therefore, these special screening considerations do not apply for Palisades Nuclear Plant and hence High Confidence of a Low Probability of Failure (HCLPF) evaluations are to be performed.

## 5.0 REVIEW LEVEL GROUND MOTION (RLGM)

### 5.1 Description of RLGM Selected

The RLGM is selected based on Approach 1 in Section 4 of EPRI 3002000704 [2]. The RLGM is developed based on the SSE [41].

The maximum GMRS/SSE ratio between 1 and 10 Hz range occurs at 10 Hz where the ratio is 0.549/0.24 = 2.29. As the maximum ratio of the GMRS to the SSE over the 1 to 10 Hz range exceeds a value of 2, the GMRS/SSE ratio is set to the maximum scaling factor value of 2.0 for Palisades Nuclear Plant in accordance with Section 4 of EPRI 3002000704. Table 5-1 lists the horizontal ground RLGM acceleration at 5% damping at selected frequencies and the plot is shown in Figure 5-1. The RLGM is generated by plotting the digitized data on a log/linear graph paper, and connecting the points with straight lines.

**Table 5-1: RLGM for Palisades Nuclear Plant**

| Frequency (Hz) | RLGM at 5% Damping (g) |
|---|---|
| 100.00 | 0.400 |
| 33.00 | 0.400 |
| 15.00 | 0.432 |
| 10.00 | 0.480 |
| 6.60 | 0.620 |
| 3.00 | 0.620 |
| 1.00 | 0.320 |
| 0.50 | 0.192 |
| 0.10 | 0.000 |

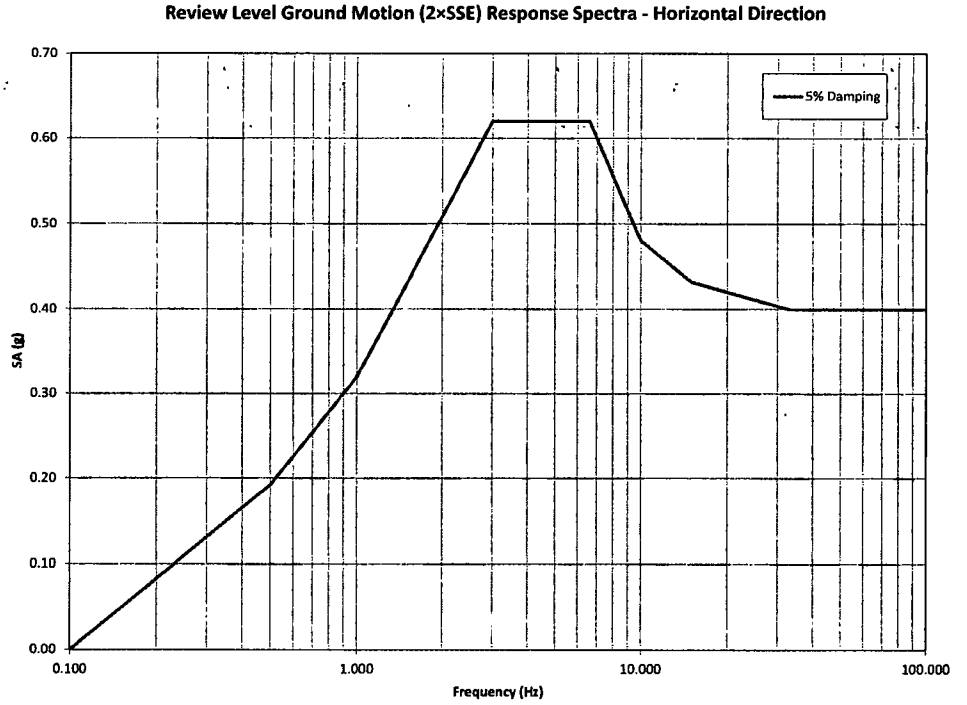


**Figure 5-1: RLGM for Palisades Nuclear Plant**

### 5.2 Method to Estimate In-Structure Response Spectra (ISRS)

The RLGM ISRS for Palisades Nuclear Plant are generated by scaling the SSE ISRS [41]. The following steps are used to generate the RLGM ISRS:

1. Obtain the horizontal direction SSE ISRS for a particular damping value.
2. Calculate the horizontal RLGM ISRS by scaling the horizontal direction SSE ISRS by a factor of 2.0.
3. Repeat steps 1 and 2 to obtain RLGM ISRS for multiple damping values.

The vertical direction RLGM ISRS is obtained by scaling the vertical amplified ground response spectrum.

## 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 PGA for which there is a HCLPF. The PGA is associated with a specific spectral shape, in this case the 5%-damped RLGM spectral shape. The HCLPF capacity must be equal to or greater than the RLGM PGA. 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-SL, A Methodology for Assessment of Nuclear Power Plant Seismic Margin (Revision 1) [42].
2. Probabilistic approach using the fragility analysis methodology of EPRI TR-103959, Methodology for Developing Seismic Fragilities [43].

### 6.1 Summary of Methodologies Used

Palisades Nuclear Plant was classified as a 0.3g focused scope in NUREG-1407 [44] and performed a Seismic Probabilistic Risk Assessment (SPRA) in accordance with the methodology of NUREG-1407 in 1996 as part of Individual Plant Examination for External Events (IPEEE) program. The SPRA is documented in [45] and consisted of screening evaluations, seismic walkdowns, and fragility analysis. SPRA screening was performed in accordance with EPRI NP-6041-SL [42]. Seismic walkdowns took advantage of overlapping requirements between IPEEE and USI A-46 programs. Section 3.3 of [40] established that the results of the Palisades Nuclear Plant IPEEE are not adequate to support screening of the updated seismic hazard for Palisades Nuclear Plant.

For ESEP, the screening walkdowns used the screening tables from Chapter 2 of EPRI NP-6041-SL. The walkdowns were conducted by engineers trained in EPRI NP-6041-SL and were documented on Screening Evaluation Work Sheets (SEWS) from EPRI NP-6041-SL. Anchorage capacity calculations used the CDFM criteria from EPRI NP-6041-SL. Seismic demand was based on EPRI 3002000704 [2] using an RLGM of 2.00xSSE with a PGA of 0.40g, Figure 5-1.

### 6.2 HCLPF Screening Process

For ESEP, the components are screened considering the RLGM (2.00×SSE) with a 0.40g PGA. The screening tables in EPRI NP-6041-SL [42] are based on ground peak spectral accelerations of 0.8g and 1.2g. These both exceed the RLGM peak spectral acceleration.

The ESEL components were prescreened based on Table 2-4 of EPRI NP-6041-SL. Additional pre-screening, specifically for anchorage, considered walkdown results and documentation from NTTF 2.3 and SEWS from IPEEE and USI A-46. Equipment anchorage was screened out in cases where previous evaluations showed large available margin against SSE. The remaining components (i.e., components that do not screen out), were identified as requiring HCLPF calculations. ESEL components were walked down and based on the equipment and anchorage conditions, prescreening decisions were confirmed and a final list of required HCLPF calculations was generated. Equipment for which the screening caveats were met and for which the anchorage capacity exceeded the RLGM seismic demand are screened out from ESEP seismic capacity determination because the HCLPF capacity exceeds the RLGM.

The Palisades Nuclear Plant ESEL contains 178 items. Of these, 47 are valves. In accordance with Table 2-4 of EPRI NP-6041-SL, active valves may be assigned a functional capacity of 0.8g peak spectral acceleration without any review other than looking for valves with large extended operators on small diameter piping, and anchorage is not a failure mode. The review of valves with large extended operators on small diameter piping is performed during walkdowns. Significant walkdown findings are summarized in Section 6.3. Therefore, valves on the ESEL are screened out from ESEP seismic capacity determination, subject to the caveat regarding large extended operators on small diameter piping.

The non-valve components in the ESEL are screened based on the SMA results. If the SMA showed that the component met the EPRI NP-6041-SL screening caveats and the CDFM capacity exceeded the RLGM demand, the components are screened out from the ESEP capacity determination.

Block walls were identified in the proximity of ESEL equipment. The HCLPF capacity of these walls was evaluated and determined to be sufficient to meet RLGM demand.

## 6.3 Seismic Walkdown Approach

### 6.3.1 Walkdown Approach

Walkdowns were performed in accordance with the criteria provided in Section 5 of EPRI 3002000704 [2], which refers to EPRI NP-6041-SL [42] for the SMA process. Pages 2-26 through 2-30 of EPRI NP-6041-SL 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 ] 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."*

### 6.3.2 Application of Previous Walkdown Information

Several ESEL items were previously walked down during the Palisades Nuclear Plant seismic IPEEE program, for the USI A-46 evaluation program, and NTTF Recommendation 2.3. Those walkdown results were reviewed and the following steps were taken to confirm that the previous walkdown conclusions remained valid.

- A walk by was performed to confirm that the equipment material condition and configuration is consistent with the walkdown conclusions and that no new significant interactions related to block walls or piping attached to tanks exist.
- If the ESEL item was screened out based on previous walkdowns, that screening evaluation was reviewed and reconfirmed for the ESEP.

### 6.3.3 Significant Walkdown Findings

Consistent with the guidance from EPRI NP-6041-SL [42], no significant outliers or anchorage concerns were identified during the Palisades Nuclear Plant seismic walkdowns. Based on pre-screening of components and walkdown results, HCLPF capacity evaluations were recommended for the following ten (10) components:

- Electrical Cabinet, EC-02
- 480V Load Center, EB-11
- Horizontal Pump, P-55C
- 125 VDC Main Station Battery, ED-01

- 125 VDC Main Station Battery, ED-02
- 480V Motor Control Center, EB-01
- Auxiliary Feedwater Controls, EJ-1051
- Primary Makeup Storage Tank, T-81
- Boric Acid Storage Tank, T-53A
- Boric Acid Storage Tank, T-53B

Block walls were identified in the proximity of ESEL equipment. These block walls were assessed for their structural adequacy to withstand the seismic loads resulting from the RLGM. For any cases where the block wall represented the HCLPF failure mode for an ESEL item, it is noted in the tabulated HCLPF values described in Section 6.6. Three (3) HCLPF evaluations were performed addressing the block walls in close proximity to components ED-01, ED-02, ED-10L, ED-10R, ED-20L, ED-20R, EB-23, EC-33, and N2 Backup Station #2.

- C-104.11Q
- C-107.16Q, C-107.17Q, and C-107.18Q
- Lube Oil Storage Room South Block Wall

## 6.4 HCLPF Calculation Process

ESEL items identified for ESEP at Palisades Nuclear Palisades were evaluated using the criteria in EPRI NP-6041-SL [42] and Section 5 of EPRI 3002000704 [2]. Those evaluations included the following steps:

- Performing seismic capability walkdowns for equipment not included in previous seismic walkdowns (SQUG, IPEEE, USI A-46, or NTTF 2.3) to evaluate the equipment installed plant conditions
- Performing screening evaluations using the screening tables in EPRI NP-6041-SL as described in Section 6.2
- Performing HCLPF calculations considering various failure modes that include both structural failure modes (e.g. anchorage, load path etc.) and functional failure modes

All HCLPF calculations were performed using the CDFM methodology. A total of eight (8) HCLPF calculations were performed to address the ten (10) components as well as three (3) calculations to address seismic adequacy of block walls.

- Electrical Cabinet EC-02
- 480V Load Center, EB-11
- Horizontal Pump, P-55C
- 125 VDC Main Station Batteries ED-01 and ED-02
- 480V Motor Control Center, EB-01
- Auxiliary Feedwater Controls, EJ-1051
- Primary Makeup Storage Tank, T-81

- Boric Acid Storage Tanks T-53A & T-53B
- Lube Oil Storage Room South Block Wall
- Block Wall, C-104.11Q
- Block Walls C-107.16Q, C-107.17Q, and C-107.18Q

### 6.5 Functional Evaluations of Relays

As discussed in Section 3.1.1, no seal in/lockout type relays were identified on Palisades Nuclear Plant ESEL. Therefore, no relay evaluations were performed.

### 6.6 Tabulated ESEL HCLPF Values (Including Key Failure Modes)

Tabulated ESEL HCLPF values are provided in Attachment B. The following notes apply to the information in the tables.

- For items screened out using EPRI NP-6041-SL [42] screening tables, the HCLPF capacity is provided as >RLGM and the failure mode is listed as "Screened", (unless the controlling HCLPF value is governed by anchorage).
- For items where anchorage controls the HCLPF value, the HCLPF value is listed in the table and the failure mode is noted as "anchorage." For the items where the component function controls the HCLPF value, the HCLPF value is listed in the table and the failure mode is noted as "functional."

After performing the HCLPF calculations, ESEL components were determined to have adequate capacity for the design basis loads and HCLPF greater than RLGM for all components except the following:

- T-53A, Boric Acid Storage Tank
- T-53B, Boric Acid Storage Tank
- T-81, Primary Makeup Storage Tank

Modifications are required for the above components.

## 7.0 INACCESSIBLE ITEMS

### 7.1 Identification of ESEL Item Inaccessible for Walkdowns

Thirty-six (36) components on the ESEL were inaccessible and not walked down because the walkdowns were performed with the plant on-line. These components are located in the Reactor Containment Building as well as in a locked, high radiation area within the Auxiliary Building. One component (LT-0372, Safety Injection Tank T-82C Level Transmitter) was evaluated based on review of existing photographs. The remaining thirty-five (35) components listed below require follow-up seismic walkdowns.

- CV-0861, Service Water System Return Isolation Valve from CAC Fan VHX-1
- CV-0864, Service Water System Return Isolation Valve from CAC Fan VHX-2

- SV-0861, Service Water System Return Isolation Valve from CAC Fan VHX-1
- SV-0864, Service Water System Return Isolation Valve from CAC Fan VHX-2
- V-1A, Containment Air Cooler Fan
- V-2A, Containment Air Cooler Fan
- V-3A, Containment Air Cooler Fan
- VHX-1, Containment Air Cooler
- VHX-2, Containment Air Cooler
- VHX-3, Containment Air Cooler
- CV-2083, CBO Isolation Valve
- CV-2099, CBO Isolation Valve
- CV-2191, CBO Relief Stop Valve
- E-56, Regenerative Heat Exchanger
- MO-3007, HPSI Injection Loop Isolation Valve
- MO-3041, SIT T-82A Isolation Valve
- MO-3045, SIT T-82B Isolation Valve
- MO-3049, SIT T-82C Isolation Valve
- MO-3052, SIT T-82D Isolation Valve
- LT-0102, PZR Level (WR) Transmitter
- LT-0365, SIT T-82A Level Transmitter
- LT-0368, SIT T-82B Level Transmitter
- LT-0374, SIT T-82D Level Transmitter
- LT-0757A, SG A WR Level Transmitter
- LT-0758A, SG B WR Level Transmitter

- PT-0105A, PZR Pressure (WR) Transmitter
- PT-0751C, SG A Pressure Transmitter
- PT-0752C, SG B Pressure Transmitter
- TE-0112CC, PCS T-cold Temperature Element
- TE-0112HC, PCS T-hot Temperature Element
- LE-0101A, Reactor Vessel Level
- T-82A, Safety Injection Tank A
- T-82B, Safety Injection Tank B
- T-82C, Safety Injection Tank C
- T-82D, Safety Injection Tank D

## 7.2 Planned Walkdown / Evaluation Schedule / Close Out

The walkdowns of the inaccessible items identified in Section 7.1 are currently scheduled to be performed during Palisades' next refueling outage with subsequent evaluations of those components to follow. Section 8.4 summarizes regulatory commitments for the close out of inaccessible components.

# 8.0 ESEP CONCLUSIONS AND RESULTS

## 8.1 Supporting Information

Palisades Nuclear Plant 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 Palisades Nuclear Plant response to the NRC's 50.54(f) letter. On March 12, 2014, NEI submitted to the NRC results of a study [46] 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 [47] concluded that the "fleet wide 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 Palisades Nuclear Plant was included in the fleet risk evaluation submitted in the March 12, 2014 NEI letter [46] therefore, the conclusions in the NRC's May 9 letter also apply to Palisades Nuclear Plant.

In addition, the March 12, 2014 NEI letter 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 for those plants that have actually experienced significant earthquakes. The seismic design process has inherent (and intentional) conservatisms which result in significant seismic margins within structures, systems and components (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 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
- 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.

The intent of the ESEP is to perform an interim action in response to the NRC's 50.54(f) letter 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 RLGM used for the ESEP evaluation is a scaled version of the plant's SSE rather than the actual GMRS. To more fully characterize the risk impacts of the seismic ground motion represented by the GMRS on a plant specific basis, a more detailed seismic risk assessment (SPRA or risk-based SMA) is to be performed in accordance with EPRI 1025287 [48]. As identified in the Palisades Nuclear Plant Seismic Hazard and GMRS submittal [40], Palisades Nuclear Plant screens in for a risk evaluation. The complete risk evaluation will more completely characterize the probabilistic seismic ground motion input into the plant, the plant response to that probabilistic seismic ground motion input, and the resulting plant risk characterization. Palisades Nuclear Plant will complete that evaluation in accordance with the schedule identified in NEI's letter dated April 9, 2013 [49] and endorsed by the NRC in their May 7, 2013 letter [50].

## 8.2 Identification of Planned Modifications

Insights from the ESEP identified the following items where the HCLPF is below the RLGM and plant modifications will be made in accordance with EPRI 3002000704 [2] to enhance the seismic capacity of the plant.

- T-53A, Boric Acid Storage Tank
- T-53B, Boric Acid Storage Tank T-53B
- T-81, Primary Makeup Storage Tank

## 8.3 Modification Implementation Schedule

Plant modifications will be performed in accordance with the schedule identified in NEI letter dated April 9, 2013 [49], which states that plant modifications not requiring a planned refueling outage will be completed by December 2016 and modifications requiring a refueling outage will be completed within two planned refueling outages after December 31, 2014.

## 8.4 Summary of Regulatory Commitments

The following actions will be performed as a result of the ESEP.

| Action # | Equipment ID | Equipment Description | Action Description | Completion Date |
|---|---|---|---|---|
| 1 | N/A | N/A | Perform seismic walkdowns, generate HCLPF calculations and design and implement any necessary modifications for inaccessible items listed in Section 7.1 | No later than the end of the second planned refueling outage after December 31, 2014.<br>Walkdowns planned for the next refueling outage. |
| 2 | T-53A | Boric Acid Storage Tank | Modify tank anchorage such that HCLPF>RLGM | As described in Section 8.3 |
| 3 | T-53B | Boric Acid Storage Tank | Modify tank anchorage such that HCLPF>RLGM | As described in Section 8.3 |
| 4 | T-81 | Primary Makeup Storage Tank | Modify tank such that HCLPF>RLGM | As described in Section 8.3 |
| 5 | N/A | N/A | Submit a letter to NRC summarizing the HCLPF results of Items 1 to 4 and confirming implementation of the plant modifications associated with items 1 to 4 | Within 60 days following completion of ESEP activities, including items 1 to 4 |

## 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, NRC ADAMS Accession No. ML12053A340.
2. EPRI 3002000704, "Seismic Evaluation Guidance, Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," May 2013.
3. Entergy Letter to U.S. NRC, letter number PNP 2013-010, "Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," February 28, 2013, NRC ADAMS Accession No. ML13246A399.
4. Entergy Letter to U.S. NRC, Letter Number PNP 2014-011, "Palisades Nuclear Plant 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, NRC ADAMS Accession No. ML14059A078.
5. Entergy Letter to U.S. NRC, Letter Number PNP 2014-085, "Palisades Nuclear Plant 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, NRC ADAMS Accession No. ML14240A278.
6. Entergy Document, Engineering Change EC-46465, "FLEX Basis."
7. Entergy Drawing E0001, Sheet 1, Revision 83, "Single Line Meter & Relay Diagram 480V Motor Control Center Warehouse, WD 950."
8. Entergy Drawing E0001, Sheet 3, Revision 4, "Plant Single Line Diagram, WD 950."
9. Entergy Drawing E0008, Sheet 1, Revision 57, "Single Line Meter & Relay Diagram 125V DC 120V Instrument & Preferred AC, System WD 950."
10. Entergy Drawing E0008, Sheet 2, Revision 55, "Single Line Meter & Relay Diagram 125V DC 120V Instrument & Preferred AC, System WD 950."
11. Entergy Drawing E0078, Sheet 2, Revision 18, "WRSGL Schematic Diagram."
12. Entergy Drawing E0078, Sheet 2A, Revision 6, "WRSGL Schematic Diagram."
13. Entergy Drawing E0082, Sheet 5, Revision 13, "Schematic Diagram Wide Range Pressurizer Level Indicator/Alarm Instrumentation."
14. Entergy Drawing E0090, Sheet 5, Revision 14, "Schematic Diagram Boric Acid System Instrumentation."
15. Entergy Drawing E0092, Revision 14, "Schematic Diagram Safety Injection Tank Level Indicator Alarm Instrumentation."
16. Entergy Drawing M0201, Sheet 1, Revision 87, "Piping & Instrument Diagram, Primary Coolant System."

17. Entergy Drawing M0201, Sheet 2, Revision 66, "Piping & Instrument Diagram, Primary Coolant System."

18. Entergy Drawing M0202, Sheet 1, Revision 76, "Piping & Instrument Diagram, Chemical & Volume Control System."

19. Entergy Drawing M0202, Sheet 1A, Revision 64, "Piping & Instrument Diagram, Chemical & Volume Control System."

20. Entergy Drawing M0202, Sheet 1B, Revision 59, "Piping & Instrument Diagram, Chemical & Volume Control System."

21. Entergy Drawing M0203, Sheet 1, Revision 48, "Piping & Instrument Diagram, Safety Injection, Containment Spray, Shutdown Cooling System."

22. Entergy Drawing M0203, Sheet 2, Revision 27, "Piping & Instrument Diagram, Safety Injection, Containment Spray, Shutdown Cooling System."

23. Entergy Drawing M0205, Sheet 2, Revision 69, "Piping & Instrument Diagram, Main Steam and Auxiliary Turbine Systems."

24. Entergy Drawing M0208, Sheet 1B, Revision 37, "Piping & Instrument Diagram, Service Water System."

25. Entergy Drawing M0220, Sheet 1, Revision 97, "Piping & Instrument Diagram, Make-up Domestic Water & Chemical Injection Systems."

26. Entergy Drawing M0207, Sheet 1, Revision 91, "Piping & Instrument Diagram, Feedwater & Condensate System."

27. Entergy Drawing M0207, Sheet 2, Revision 38, "Piping & Instrument Diagram, Auxiliary Feedwater System."

28. Entergy Procedure Palisades EOP-3.0, Revision 16, "Station Blackout."

29. Entergy Drawing E0364, Revision 9, "Conduit and Tray Miscellaneous Plans."

30. Entergy Drawing E0618, Sheet 569, Revision 12, "Connection Diagram Junction Box J569."

31. Entergy Drawing M0222, Sheet 2, Revision 29 (EC-47346), "Piping & Instrument Diagram, Miscellaneous Gas Supply Systems."

32. Entergy Drawing M0218, Sheet 2, Revision 61, "Piping & Instrument Diagram, Htg. Vent. & Air Cond. Containment Building."

33. Entergy Drawing E0005, Sheet 5B, Revision 12, "Single Line Meter & Relay Diagram 480 Volt Motor Control Centers, System WD 950."

34. Entergy Drawing E0099 Sh. 5, Revision 10, "Schematic Diagram, Containment Building Instrumentation (Left Channel)."

35. Entergy Drawing E0084 Sh. 6, Revision 14, "Schematic Diagram, Pressurizer Pressure Control and Measurement Channel Instrumentation."

36. Entergy Drawing E0087, Sh. 6, Revision 10, "Schematic Diagram Level Indication and Alarm Indication."

37. Entergy Drawing E0076, Sheet 4C, Revision 8, "Schematic Diagram Feedwater and Turbine Driver Instrumentation."

38. Entergy Drawing E0226, Sheet 1B, Revision 6, "Schematic Diagram – Reactor Vessel Level Monitoring System (Left Channel)."

39. "Palisades Nuclear Plant - Final Safety Analysis Report," Revision 31, Docket 50-255, September 2014.

40. Entergy Letter to U.S. NRC, letter number PNP 2014-033, "Palisades Nuclear Plant Seismic Hazard and Screening Report (CEUS Sites), 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," dated March 31, 2014, NRC ADAMS Accession No. ML14090A069.

41. Entergy Technical Specification C-175(Q), Revision 6, "Requirements for Seismic Evaluation of Electrical and Mechanical Equipment."

42. EPRI-NP-6041-SL, "Methodology for Assessment of Nuclear Power Plant Seismic Margin," Revision 1, August 1991.

43. EPRI TR-103959, "Methodology for Developing Seismic Fragilities," July 1994.

44. NRC NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," June 1991.

45. Entergy Document, "Palisades Nuclear Plant Individual Plant Examination of External Events (IPEEE)," Revision 1, May 1996.

46. 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.

47. 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, NRC ADAMS Accession No. ML14111A147.

48. EPRI 1025287, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic. Electric Power Research Institute," February 2013.

49. Nuclear Energy Institute (NEI), A. Pietrangelo, Letter to D. Skeen of the USNRC, "Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations," April 9, 2013, NRC ADAMS Accession No. ML13101A379.

50. NRC (E Leeds) Letter to NEI (J Pollock), "Electric Power Research Institute Final Draft Report xxxxx, "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 Reevaluations," May 7, 2013, NRC ADAMS Accession No. ML13106A331.

51. Entergy Calculation EA-EC46465-05, "Anchorage Calculations for Electrical Panels EP-1901 and EP-2001," Revision 0.

52. Entergy Document, EA-EC48188-02, "Seismic Bracing of Non-Q Block Wall – South Wall of Lube Oil Storage Room," Revision 0.

53. Entergy Document EC54011, "Fukushima Seismic 2.1 – Expedited Seismic Evaluation Program (ESEP) Report – Owner Acceptance of Report and Background Documentation," the following AREVA documents are captured in the plant document management system:

    a. AREVA Document 51-9212955-007, "ESEP Expedited Seismic Equipment List (ESEL) – Palisades Nuclear Plant."

    b. AREVA Calculation 32-9227862-001, "Palisades ESEP HCLPF Calculation – Electrical Cabinet EC-02."

    c. AREVA Calculation 32-9227902-001, "Palisades ESEP HCLPF Calculation – 480V Load Center, EB-11."

    d. AREVA Calculation 32-9227941-001, "Palisades ESEP HCLPF Calculation – Horizontal Pump, P-55C."

    e. AREVA Calculation 32-9227961-001, "Palisades ESEP HCLPF Calculation – 125 VDC Main Station Batteries ED-01 and ED-02."

    f. AREVA Calculation 32-9228097-001, "Palisades ESEP HCLPF Calculation – 480V Motor Control Center, EB-01."

    g. AREVA Calculation 32-9228681-001, "Palisades ESEP HCLPF Calculation – Auxiliary Feedwater Controls, EJ-1051."

    h. AREVA Calculation 32-9229831-002, "Palisades ESEP HCLPF Calculation – Primary Makeup Storage Tank, T-81."

    i. AREVA Calculation 32-9230336-001, "Palisades ESEP Screening of Lube Oil Storage Room South Block Wall."

    j. AREVA Calculation 32-9230249-003, Palisades ESEP HCLPF Calculation – Boric Acid Storage Tanks T-53A & T-53B."

    k. AREVA Calculation 32-9228279-002, "Palisades ESEP HCLPF Calculation – Block Wall, C-104.11Q."

    l. AREVA Calculation 32-9228841-001, "Palisades ESEP HCLPF Calculation – Block Walls C-107.16Q, C-107.17Q, and C-107.18Q."

# ATTACHMENT A – PALISADES NUCLEAR PLANT ESEL

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 1 | CV-0861 | Service Water System Return Isolation Valve from CAC Fan VHX-1 | Closed | Open | | [24] |
| 2 | CV-0864 | Service Water System Return Isolation Valve from CAC Fan VHX-2 | Closed | Open | | [24] |
| 3 | SV-0861 | Service Water System Return Isolation Valve from CAC Fan VHX-1 | Energized | De-energized | Deenergize to open CV-0861 Breaker 52-1208 | [24] |
| 4 | SV-0864 | Service Water System Return Isolation Valve from CAC Fan VHX-2 | Energized | De-energized | Deenergize to open CV-0864 Breaker 52-1209 | [24] |
| 5 | V-1A | Containment Air Cooler Fan | Available | Available | | [32] |
| 6 | V-2A | Containment Air Cooler Fan | Available | Available | | [32] |
| 7 | V-3A | Containment Air Cooler Fan | Available | Available | | [32] |
| 8 | VHX-1 | Containment Air Cooler | Available | Available | | [32] |
| 9 | VHX-2 | Containment Air Cooler | Available | Available | | [32] |
| 10 | VHX-3 | Containment Air Cooler | Available | Available | | [32] |
| 11 | CV-0522B | TDAFW pump steam inlet valve | Closed | Open | | [23] |
| 12 | CV-0727 | AFW flow control valve (SG B) | Closed | Throttled | | [27] |
| 13 | CV-0749 | AFW flow control valve (SG A) | Closed | Throttled | | [27] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 14 | CV-0779 | ADV (SG E-50B) | Closed | Open as needed | Automatically or manually opened | [26] |
| 15 | CV-0780 | ADV (SG E-50B) | Closed | Open as needed | Automatically or manually opened | [26] |
| 16 | CV-0781 | ADV (SG E-50A) | Closed | Open as needed | Automatically or manually opened | [26] |
| 17 | CV-0782 | ADV (SG E-50A) | Closed | Open as needed | Automatically or manually opened | [26] |
| 18 | CV-2008 | T-81 Isolation Valve | Closed | Open | | [25] |
| 19 | CV-2010 | T-81 Isolation Valve | Closed | Open | | [25] |
| 20 | E/P-0779 | ADV (SG E-50B) | On | On | | [26] |
| 21 | E/P-0780 | ADV (SG E-50B) | On | On | | [26] |
| 22 | E/P-0781 | ADV (SG E-50A) | On | On | | [26] |
| 23 | E/P-0782 | ADV (SG E-50A) | On | On | | [26] |
| 24 | HIC-0780A | Hand Indicating Controller | Auto | Auto | | [26] |
| 25 | HIC-0780B | Hand Indicating Controller | Auto | Auto | | [26] |
| 26 | HIC-0781B | Hand Indicating Controller | Auto | Auto | | [26] |
| 27 | P-8B | TDAFW pump | Standby | Operating | | [27] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 28 | POC-0779 | ADV (SG E-50B) | Modulate as necessary | Modulate as necessary | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 29 | POC-0780 | ADV (SG E-50B) | Modulate as necessary | Modulate as necessary | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 30 | POC-0781 | ADV (SG E-50A) | Modulate as necessary | Modulate as necessary | | [26] |
| 31 | POC-0782 | ADV (SG E-50A) | Modulate as necessary | Modulate as necessary | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 32 | SV-0522B | TDAFW pump steam inlet valve | De-energized | Energized | | [23] |
| 33 | SV-0779A | ADV (SG E-50B) | Energized | Energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 34 | SV-0779B | ADV (SG E-50B) | De-energized | De-energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 35 | SV-0779C | ADV (SG E-50B) | De-energized | De-energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 36 | SV-0780A | ADV (SG E-50B) | Energized | Energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 37 | SV-0780B | ADV (SG E-50B) | De-energized | De-energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 38 | SV-0780C | ADV (SG E-50B) | De-energized | De-energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 39 | SV-0781A | ADV (SG E-50A) | Energized | Energized | Energized to close. Same for all ADV SV "A" valves. When closed, ADVs can be operated from controller. | [26] |
| 40 | SV-0781B | ADV (SG E-50A) | De-energized | De-energized | Deenergized to open. Same for all ADV SV "B" valves. When open, ADVs can be operated from controller. | [26] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 41 | SV-0781C | ADV (SG E-50A) | De-energized | De-energized | Deenergized to close. Same for all ADV SV "C" valves. When closed, ADVs can be operated from controller. | [26] |
| 42 | SV-0782A | ADV (SG E-50A) | Energized | Energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 43 | SV-0782B | ADV (SG E-50A) | De-energized | De-energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 44 | SV-0782C | ADV (SG E-50A) | De-energized | De-energized | Controls for CV-0781 shown on reference Others typical of that arrangement | [26] |
| 45 | SV-2008 | T-81 Isolation Valve | De-energized | Energized | | [25] |
| 46 | SV-2010 | T-81 Isolation Valve | De-energized | Energized | | [25] |
| 47 | SV-2235 | Primary System Make-up Transfer Pump Isolation Valve (new) | Energized | De-energized | New FLEX valve. Required closed to prevent inventory diversion. Not yet installed. | - |
| 48 | SV-2236 | Primary System Make-up Transfer Pump Bypass Isolation Valve (new) | Energized | De-energized | New FLEX valve. Required closed to prevent inventory diversion. Not yet installed. | - |
| 49 | T-2 | Condensate Storage Tank | Available | Available | T-81 and CST combined volume > 100k gal (Phase 1 - 8+ hrs); Long term water source (Phase 2) is Lake Michigan directly into steam generator via AFW or MFW header using a portable FLEX pump. | [25] |
| 50 | T-81 | Primary Makeup Storage Tank | Available | Available | T-81 and CST combined volume > 100k gal (Phase 1 - 8+ hrs); Long term water source (Phase 2) is Lake Michigan directly into steam generator via AFW or MFW header using a portable FLEX pump. Screening HCLPF of 0.1 used for IPEEE. | [25] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 51 | CV-2083 | CBO Isolation Valve | Open | Closed | Bleedoff must be isolated to support assumption of PCP leakage of 1 gpm/pump | [18] |
| 52 | CV-2099 | CBO Isolation Valve | Open | Closed | Bleedoff must be isolated to support assumption of PCP leakage of 1 gpm/pump | [18] |
| 53 | CV-2191 | CBO Relief Stop Valve | Open | Closed | Bleedoff must be isolated to support assumption of PCP leakage of 1 gpm/pump | [18] |
| 54 | E-27 | Condensate Storage Tank Heat Exchanger | N/A | N/A | Listed per EPRI Q&A 3.20 to ensure heat exchanger pressure boundary integrity | [25] |
| 55 | E-56 | Regenerative Heat Exchanger | N/A | N/A | Listed per EPRI Q&A 3.20 to ensure heat exchanger pressure boundary integrity | [20] |
| 56 | MO-2087 | VCT Supply to Charging Pumps | Open | Closed | VCT volume is not credited and must be isolated in Phase 2 | [19] |
| 57 | MO-3007 | HPSI Injection Loop Isolation Valve | Closed | Open | | [22] |
| 58 | MO-3041 | SIT T-82A Isolation Valve | Open | Closed | Closure to prevent N2 injection; associated relay in A-46 program | [21] |
| 59 | MO-3045 | SIT T-82B Isolation Valve | Open | Closed | Closure to prevent N2 injection; associated relay in A-46 program | [21] |
| 60 | MO-3049 | SIT T-82C Isolation Valve | Open | Closed | Closure to prevent N2 injection; associated relay in A-46 program | [21] |
| 61 | MO-3052 | SIT T-82D Isolation Valve | Open | Closed | Closure to prevent N2 injection; associated relay in A-46 program | [21] |
| 62 | P-55C | Charging Pump P-55C | Off | On | Deviation taken from NEI 12-06 Sect 3.2.2 (12); (Phase 2) | [20] |
| 63 | T-53A | Boric Acid Storage Tank T-53A | Available | Available | | [19] |
| 64 | T-53B | Boric Acid Storage Tank T-53B | Available | Available | | [19] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 65 | EA-11 | 2400V Bus 1C | Available | Available | | [7] |
| 66 | EB-01 | 480 V MCC 1 | Available | Available | | [7] |
| 67 | EB-11 | 480V Bus LCC-11 | Available | Available | Bus supplies charging pump P55C power | [7] |
| 68 | EB-19 | 480V Bus LCC-19 | Available | Available | Powers MCC-1 which feeds BC 1 & 4, LCC-11, & emergency lighting panel L-04A | [8] |
| 69 | EB-21 | 480 V MCC 21 | Available | Available | Support SIT Isolation | [33] |
| 70 | EB-23 | 480 V MCC 23 | Available | Available | Support SIT Isolation | [33] |
| 71 | EC-01 | Electrical Cabinet | Available | Available | Control room panel | - |
| 72 | EC-02 | Electrical Cabinet | Available | Available | Control room panel | - |
| 73 | EC-11 | Electrical Cabinet | Available | Available | Control room panel | - |
| 74 | EC-12 | Electrical Cabinet | Available | Available | Control room panel | - |
| 75 | EC-13 | Electrical Cabinet | Available | Available | Control room panel | - |
| 76 | EC-182 | ADV Panel | Available | Available | | - |
| 77 | EC-33 | Electrical Cabinet | Available | Available | Not required – was for valves removed from ESEL | - |
| 78 | ED-01 | 125VDC Battery #1 | Available | Available | | [9] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 79 | ED-02 | 125VDC Battery #2 | Available | Available | | [9] |
| 80 | ED-06 | Inverter 1 | Available | Available | | [10] |
| 81 | ED-07 | Inverter 2 | Available | Available | | [10] |
| 82 | ED-08 | Inverter 3 | Available | Available | | [10] |
| 83 | ED-09 | Inverter 4 | Available | Available | | [10] |
| 84 | ED-10L | DC Bus D10L | Available | Available | | [9] |
| 85 | ED-10R | DC Bus D10R | Available | Available | | [9] |
| 86 | ED-11 | 125VDC Panel ED-11 (-1, -2) | Available | Available | | [10] |
| 87 | ED-13 | DC Bus Metering Section | Available | Available | | [9] |
| 88 | ED-15 | Battery Charger #1 | Available | Available | | [9] |
| 89 | ED-18 | Battery Charger #4 | Available | Available | | [9] |
| 90 | ED-20L | DC Bus D20L | Available | Available | | [9] |
| 91 | ED-20R | DC Bus D20R | Available | Available | | [9] |
| 92 | ED-21-1 | 125VDC Panel ED-21-1 | Available | Available | | [10] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 93 | ED-21-2 | 125VDC Panel ED-21 -2 | Available | Available | | [10] |
| 94 | ED-23 | DC Bus Metering Section | Available | Available | | [9] |
| 95 | EJ-1051 | Junction Box | Available | Available | | - |
| 96 | EJ-569 | Junction Box | Available | Available | | [30] |
| 97 | EP-1901 | FLEX Electrical Box | Off | On | 480V FLEX generator will connect to this new panel (FLEX Modification). Anchorage calculation EA-EC46465-05. Not yet installed. | [51] |
| 98 | EX-11 | 2400/480 V Transformer | Available | Available | | [7] |
| 99 | EX-19 | 2400/480 V Transformer | Available | Available | | [8] |
| 100 | EY-10 | Preferred 120 VAC Panel 1 (Y-10) | Available | Available | | [10] |
| 101 | EY-20 | Preferred 120 VAC Panel 2 (Y-20) | Available | Available | | [10] |
| 102 | EY-30 | Preferred 120 VAC Panel 3 (Y-30) | Available | Available | | [10] |
| 103 | EY-40 | Preferred 120 VAC Panel 4 (Y-40) | Available | Available | | [10] |
| 104 | N2 Backup Station #1 | N2 Backup Station #1 | Available | Available | Support AFW Flow Control Valves CV-0727, 0749. Listed per EPRI Q&A 3.22. | [31] |
| 105 | N2 Backup Station #2 | N2 Backup Station #2 | Available | Available | Support AFW TDAFW pump steam supply valve CV-0522B. Listed per EPRI Q&A 3.22. | [31] |
| 106 | N2 Backup Station #9 | N2 Backup Station #9 | Available | Available | Support ADVs. Listed per EPRI Q&A 3.22. FLEX equipment not yet installed. | [31] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 107 | FIC-0727 | AFW (E-50A) Flow Indicator Controller | On | On | | [27] |
| 108 | FM-0727 | AFW (E-50B) Flow Monitor | On | On | Square root extractor. | [27] |
| 109 | FT-0727 | AFW (E-50B) Flow Transmitter | On | On | | [27] |
| 110 | HIC-0727 | AFW (E-50B) Hand Indicator Controller | Auto | Auto | | [27] |
| 111 | I/P-0727 | Signal Converter - AFW flow control valve (SG B) | Modulate as necessary | Modulate as necessary | | [27] |
| 112 | P/S-0727 | Power Supply - AFW (E-50B) Flow Transmitter | On | On | | [37] |
| 113 | FIC-0749 | AFW (E-50A) Flow Indicator Controller | On | On | | [27] |
| 114 | FM-0749 | AFW (E-50A) Flow Monitor | On | On | Square root extractor. | [27] |
| 115 | FT-0749 | AFW (E-50A) Flow Transmitter | On | On | | [27] |
| 116 | HIC-0749 | AFW (E-50A) Hand Indicator Controller | Auto | Auto | | [27] |
| 117 | I/P-0749 | Signal converter - AFW flow control valve (SG A) | Modulate as necessary | Modulate as necessary | | [27] |
| 118 | P/S-0727A | Power Supply - AFW (E-50A) Flow Transmitter | On | On | | [37] |
| 119 | P/S-0206 | Power Supply - BAST T-53B Level Indication | On | On | Not available until Phase 2 (powered by FLEX generator) | [14] |
| 120 | LIA-0206 | Boric Acid Storage Tank T-53B Level Indication | On | On | Not available until Phase 2 (powered by FLEX generator) | [19] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 121 | LIT-0206 | Boric Acid Storage Tank T-53B Level Transmitter | On | On | Not available until Phase 2 (powered by FLEX generator) | [19] |
| 122 | LIA-0208 | Boric Acid Storage Tank T-53A Level Indication | On | On | Not available until Phase 2 (powered by FLEX generator) | [19] |
| 123 | LIT-0208 | Boric Acid Storage Tank T-53A Level Transmitter | On | On | Not available until Phase 2 (powered by FLEX generator) | [19] |
| 124 | P/S-0208 | Power Supply - BAST T-53A Level Indication | On | On | Not available until Phase 2 (powered by FLEX generator) | [14] |
| 125 | LIA-0102A | PZR Level (WR) Indicator | On | On | | [17] |
| 126 | LT-0102 | PZR Level (WR) Transmitter | On | On | | [17] |
| 127 | LIA-0365 | SIT T-82A Level Indication | On | On | Monitor to prevent N2 injection | [21] |
| 128 | LM-0365 | SIT T-82A Level Monitor | On | On | Square root extractor | [21] |
| 129 | LT-0365 | SIT T-82A Level Transmitter | On | On | Monitor to prevent N2 injection | [21] |
| 130 | P/S-0365 | Power Supply - SIT T-82A Level Indication | On | On | Monitor to prevent N2 injection | [15] |
| 131 | LIA-0368 | SIT T-82B Level Indication | On | On | Monitor to prevent N2 injection | [21] |
| 132 | LM-0368 | SIT T-82B Level Monitor | On | On | Square root extractor | [21] |
| 133 | LT-0368 | SIT T-82B Level Transmitter | On | On | Monitor to prevent N2 injection | [21] |
| 134 | P/S-0368 | Power Supply - SIT T-82B Level Indication | On | On | Monitor to prevent N2 injection | [15] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 135 | LIA-0372 | SIT T-82C Level Indication | On | On | Monitor to prevent N2 injection | [21] |
| 136 | LM-0372 | SIT T-82C Level Monitor | On | On | Square root extractor | [21] |
| 137 | LT-0372 | SIT T-82C Level Transmitter | On | On | Monitor to prevent N2 injection | [21] |
| 138 | P/S-0372 | Power Supply - SIT T-82C Level Indication | On | On | Monitor to prevent N2 injection | [15] |
| 139 | LIA-0374 | SIT T-82D Level Indication | On | On | Monitor to prevent N2 injection | [21] |
| 140 | LM-0374 | SIT T-82D Level Monitor | On | On | Square root extractor | [21] |
| 141 | LT-0374 | SIT T-82D Level Transmitter | On | On | Monitor to prevent N2 injection | [21] |
| 142 | P/S-0374 | Power Supply - SIT T-82D Level Indication | On | On | Monitor to prevent N2 injection | [15] |
| 143 | P/S-0751A | SG E-50A&B Pressure Level Channel A Power Supply | On | On | Power supply for LT-0102. | [13] |
| 144 | P/S-0751C | SG E-50A&B Pressure Level Channel A Power Supply | On | On | | - |
| 145 | LI-0757A | SG A WR Level Indication | On | On | 2 WR/SG | [26] |
| 146 | LT-0757A | SG A WR Level Transmitter | On | On | 2 WR/SG | [26] |
| 147 | P/S-0757A | Power Supply - SG A WR Level Transmitter | On | On | | [11] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 148 | LI-0758A | SG B WR Level Indication | On | On | 2 WR/SG | [26] |
| 149 | LT-0758A | SG B WR Level Transmitter | On | On | 2 WR/SG | [26] |
| 150 | P/S-0758A | Power Supply - SG B WR Level Transmitter | On | On | | [12] |
| 151 | LIA-2021 | CST (T-2) Level Indication | On | On | | [25] |
| 152 | LT-2021 | CST (T-2) Level Transmitter | On | On | | [25] |
| 153 | P/S-2021 | Power Supply - CST (T-2) Level Indication | On | On | | [36] |
| 154 | PI-0105A | PZR Pressure (WR) Indicator | On | On | | [17] |
| 155 | PT-0105A | PZR Pressure (WR) Transmitter | On | On | | [17] |
| 156 | PTR-0112 | Wide Range Primary Temperature & Pressure Recorder | On | On | For PT-0105A, TE-0112CC and TE-0112HC | [35] |
| 157 | PIC-0751C | SG A Pressure Indicator Controller | On | On | 2 WR/SG | [26] |
| 158 | PT-0751C | SG A Pressure Transmitter | On | On | 2 WR/SG | [26] |
| 159 | PIC-0752C | SG B Pressure Indicator Controller | On | On | 2 WR/SG | [26] |
| 160 | PT-0752C | SG B Pressure Transmitter | On | On | 2 WR/SG | [26] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 161 | LPIR-0383 | Containment Sump Level/Pressure Indication | On | On | | [34] |
| 162 | P/S-1812A | Power Supply - Containment Pressure Transmitter | On | On | Power supply for PT-1812A | [34] |
| 163 | PT-1812A | Containment Pressure Transmitter | On | On | | [32] |
| 164 | TE-0112CC | PCS T-cold Temperature Element | On | On | | [16] |
| 165 | TT-0112CC | PCS T-cold Temperature Transmitter | On | On | | [16] |
| 166 | TE-0112HC | PCS T-hot Temperature Element | On | On | | [16] |
| 167 | TT-0112HC | PCS T-hot Temperature Transmitter | On | On | | [16] |
| 168 | LE-0101A | Reactor vessel level | Available | Available | For Modes 5 and 6 | [38] |
| 169 | LRI-0101A1 | Reactor vessel level indicator recorder– Head Region | Available | Available | For Modes 5 and 6 | [38] |
| 170 | LRI-0101A2 | Reactor vessel level indicator recorder – Upper Guide Structure | Available | Available | For Modes 5 and 6 | [38] |
| 171 | EC-11A | Post Accident Panel | Available | Available | For Modes 5 and 6 | [38] |
| 172 | P/S-0101AA | Power supply for LE-0101A | Available | Available | For Modes 5 and 6 | [38] |
| 173 | T-82A | Safety Injection Tank A | Available | Available | | [21] |

| ESEL Item Number | Equipment | | Operating State | | Notes/Comments | References |
|---|---|---|---|---|---|---|
| | ID | Description | Normal State | Desired State | | |
| 174 | T-82B | Safety Injection Tank B | Available | Available | | [21] |
| 175 | T-82C | Safety Injection Tank C | Available | Available | | [21] |
| 176 | T-82D | Safety Injection Tank D | Available | Available | | [21] |
| 177 | CV-0599 | TDAFW Trip/throttle valve | Open | Open | | [23] |
| 178 | CV-0598 | TDAFW Governor valve | Open | Cycle | | [23] |

# ATTACHMENT B – ESEP HCLPF VALUES AND FAILURE MODES TABULATION

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 1 | CV-0861 | Service Water System Return Isolation Valve from CAC Fan VHX-1 | TBD | TBD | Note 3 |
| 2 | CV-0864 | Service Water System Return Isolation Valve from CAC Fan VHX-2 | TBD | TBD | Note 3 |
| 3 | SV-0861 | Service Water System Return Isolation Valve from CAC Fan VHX-1 | TBD | TBD | Note 3 |
| 4 | SV-0864 | Service Water System Return Isolation Valve from CAC Fan VHX-2 | TBD | TBD | Note 3 |
| 5 | V-1A | Containment Air Cooler Fan | TBD | TBD | Note 3 |
| 6 | V-2A | Containment Air Cooler Fan | TBD | TBD | Note 3 |
| 7 | V-3A | Containment Air Cooler Fan | TBD | TBD | Note 3 |
| 8 | VHX-1 | Containment Air Cooler | TBD | TBD | Note 3 |
| 9 | VHX-2 | Containment Air Cooler | TBD | TBD | Note 3 |
| 10 | VHX-3 | Containment Air Cooler | TBD | TBD | Note 3 |
| 11 | CV-0522B | TDAFW pump steam inlet valve | >RLGM | Screened | Note 2 |
| 12 | CV-0727 | AFW flow control valve (SG B) | >RLGM | Screened | |
| 13 | CV-0749 | AFW flow control valve (SG A) | >RLGM | Screened | |
| 14 | CV-0779 | ADV (SG E-50B) | >RLGM | Screened | |
| 15 | CV-0780 | ADV (SG E-50B) | >RLGM | Screened | |
| 16 | CV-0781 | ADV (SG E-50A) | >RLGM | Screened | |
| 17 | CV-0782 | ADV (SG E-50A) | >RLGM | Screened | |
| 18 | CV-2008 | T-81 Isolation Valve | >RLGM | Screened | |
| 19 | CV-2010 | T-81 Isolation Valve | >RLGM | Screened | |

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 20 | E/P-0779 | ADV (SG E-50B) | >RLGM | Screened | |
| 21 | E/P-0780 | ADV (SG E-50B) | >RLGM | Screened | |
| 22 | E/P-0781 | ADV (SG E-50A) | >RLGM | Screened | |
| 23 | E/P-0782 | ADV (SG E-50A) | >RLGM | Screened | |
| 24 | HIC-0780A | Hand Indicating Controller | >RLGM | Screened | |
| 25 | HIC-0780B | Hand Indicating Controller | >RLGM | Screened | |
| 26 | HIC-0781B | Hand Indicating Controller | >RLGM | Screened | |
| 27 | P-8B | TDAFW pump | >RLGM | Screened | Note 1 |
| 28 | POC-0779 | ADV (SG E-50B) | >RLGM | Screened | |
| 29 | POC-0780 | ADV (SG E-50B) | >RLGM | Screened | |
| 30 | POC-0781 | ADV (SG E-50A) | >RLGM | Screened | |
| 31 | POC-0782 | ADV (SG E-50A) | >RLGM | Screened | |
| 32 | SV-0522B | TDAFW pump steam inlet valve | >RLGM | Screened | |
| 33 | SV-0779A | ADV (SG E-50B) | >RLGM | Screened | |
| 34 | SV-0779B | ADV (SG E-50B) | >RLGM | Screened | |
| 35 | SV-0779C | ADV (SG E-50B) | >RLGM | Screened | |
| 36 | SV-0780A | ADV (SG E-50B) | >RLGM | Screened | |
| 37 | SV-0780B | ADV (SG E-50B) | >RLGM | Screened | |
| 38 | SV-0780C | ADV (SG E-50B) | >RLGM | Screened | |
| 39 | SV-0781A | ADV (SG E-50A) | >RLGM | Screened | |
| 40 | SV-0781B | ADV (SG E-50A) | >RLGM | Screened | |

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 41 | SV-0781C | ADV (SG E-50A) | >RLGM | Screened | |
| 42 | SV-0782A | ADV (SG E-50A) | >RLGM | Screened | |
| 43 | SV-0782B | ADV (SG E-50A) | >RLGM | Screened | |
| 44 | SV-0782C | ADV (SG E-50A) | >RLGM | Screened | |
| 45 | SV-2008 | T-81 Isolation Valve | >RLGM | Screened | |
| 46 | SV-2010 | T-81 Isolation Valve | >RLGM | Screened | |
| 47 | SV-2235 | Primary System Make-up Transfer Pump Isolation Valve (new) | Not Applicable | Not Applicable | New FLEX component to be seismically designed. |
| 48 | SV-2236 | Primary System Make-up Transfer Pump Bypass Isolation Valve (new) | Not Applicable | Not Applicable | New FLEX component to be seismically designed. |
| 49 | T-2 | Condensate Storage Tank | >RLGM | Screened | Note 1 |
| 50 | T-81 | Primary Makeup Storage Tank | 0.19 | Tank Shell Buckling | Modification Required |
| 51 | CV-2083 | CBO Isolation Valve | TBD | TBD | Note 3 |
| 52 | CV-2099 | CBO Isolation Valve | TBD | TBD | Note 3 |
| 53 | CV-2191 | CBO Relief Stop Valve | TBD | TBD | Note 3 |
| 54 | E-27 | Condensate Storage Tank Heat Exchanger | >RLGM | Screened | Note 2 |
| 55 | E-56 | Regenerative Heat Exchanger | TBD | TBD | Note 3 |
| 56 | MO-2087 | VCT Supply to Charging Pumps | >RLGM | Screened | |
| 57 | MO-3007 | HPSI Injection Loop Isolation Valve | TBD | TBD | Note 3 |
| 58 | MO-3041 | SIT T-82A Isolation Valve | TBD | TBD | Note 3 |
| 59 | MO-3045 | SIT T-82B Isolation Valve | TBD | TBD | Note 3 |

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 60 | MO-3049 | SIT T-82C Isolation Valve | TBD | TBD | Note 3 |
| 61 | MO-3052 | SIT T-82D Isolation Valve | TBD | TBD | Note 3 |
| 62 | P-55C | Charging Pump P-55C | 0.47 | Anchorage | |
| 63 | T-53A | Boric Acid Storage Tank T-53A | 0.46 | Anchorage | HCLPF calculated with modifications to tank supports. |
| 64 | T-53B | Boric Acid Storage Tank T-53B | 0.46 | Anchorage | HCLPF calculated with modifications to tank supports. |
| 65 | EA-11 | 2400V Bus 1C | >RLGM | Screened | Note 1 |
| 66 | EB-01 | 480 V MCC 1 | 0.41 | Functional | |
| 67 | EB-11 | 480V Bus LCC-11 | 0.44 | Anchorage | |
| 68 | EB-19 | 480V Bus LCC-19 | >RLGM | Screened | Note 2 |
| 69 | EB-21 | 480 V MCC 21 | >RLGM | Screened | Note 1 |
| 70 | EB-23 | 480 V MCC 23 | 0.40 | Block Wall | Note 1 |
| 71 | EC-01 | Electrical Cabinet | >RLGM | Screened | Note 2 |
| 72 | EC-02 | Electrical Cabinet | 0.50 | Anchorage | |
| 73 | EC-11 | Electrical Cabinet | >RLGM | Screened | Note 1 |
| 74 | EC-12 | Electrical Cabinet | >RLGM | Screened | Note 1 |
| 75 | EC-13 | Electrical Cabinet | >RLGM | Screened | Note 1 |
| 76 | EC-182 | ADV Panel | >RLGM | Screened | Note 2 |
| 77 | EC-33 | Electrical Cabinet | 0.42 | Block Wall | Note 1 |
| 78 | ED-01 | 125VDC Battery #1 | 0.40 | Block Wall | |
| 79 | ED-02 | 125VDC Battery #2 | 0.40 | Block Wall | |

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 80 | ED-06 | Inverter 1 | >RLGM | Screened | Note 1 |
| 81 | ED-07 | Inverter 2 | >RLGM | Screened | Note 1 |
| 82 | ED-08 | Inverter 3 | >RLGM | Screened | Note 1 |
| 83 | ED-09 | Inverter 4 | >RLGM | Screened | Note 1 |
| 84 | ED-10L | DC Bus D10L | 0.40 | Block Wall | Note 1 |
| 85 | ED-10R | DC Bus D10R | 0.40 | Block Wall | Note 1 |
| 86 | ED-11 | 125VDC Panel ED-11 (-1, -2) | >RLGM | Screened | |
| 87 | ED-13 | DC Bus Metering Section | >RLGM | Screened | |
| 88 | ED-15 | Battery Charger #1 | >RLGM | Screened | Note 1 |
| 89 | ED-18 | Battery Charger #4 | >RLGM | Screened | Note 1 |
| 90 | ED-20L | DC Bus D20L | 0.40 | Block Wall | Note 1 |
| 91 | ED-20R | DC Bus D20R | 0.40 | Block Wall | Note 1 |
| 92 | ED-21-1 | 125VDC Panel ED-21-1 | >RLGM | Screened | |
| 93 | ED-21-2 | 125VDC Panel ED-21 -2 | >RLGM | Screened | |
| 94 | ED-23 | DC Bus Metering Section | >RLGM | Screened | |
| 95 | EJ-1051 | Junction Box | 0.46 | Anchorage | |
| 96 | EJ-569 | Junction Box | >RLGM | Screened | Note 2 |
| 97 | EP-1901 | FLEX Electrical Box | >RLGM | Screened | Note 4 |
| 98 | EX-11 | 2400/480 V Transformer | >RLGM | Screened | Note 1 |
| 99 | EX-19 | 2400/480 V Transformer | >RLGM | Screened | Note 2 |
| 100 | EY-10 | Preferred 120 VAC Panel 1 (Y-10) | >RLGM | Screened | |

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 101 | EY-20 | Preferred 120 VAC Panel 2 (Y-20) | >RLGM | Screened | |
| 102 | EY-30 | Preferred 120 VAC Panel 3 (Y-30) | >RLGM | Screened | |
| 103 | EY-40 | Preferred 120 VAC Panel 4 (Y-40) | >RLGM | Screened | |
| 104 | N2 Backup Station #1 | N2 Backup Station #1 | >RLGM | Screened | Note 2 |
| 105 | N2 Backup Station #2 | N2 Backup Station #2 | >RLGM | Block Wall | Note 5 |
| 106 | N2 Backup Station #9 | N2 Backup Station #9 | Not Applicable | Not Applicable | New FLEX component to be seismically designed. |
| 107 | FIC-0727 | AFW (E-50A) Flow Indicator Controller | >RLGM | Screened | Note 2 |
| 108 | FM-0727 | AFW (E-50B) Flow Monitor | >RLGM | Screened | |
| 109 | FT-0727 | AFW (E-50B) Flow Transmitter | >RLGM | Screened | |
| 110 | HIC-0727 | AFW (E-50B) Hand Indicator Controller | >RLGM | Screened | |
| 111 | I/P-0727 | Signal Converter - AFW flow control valve (SG B) | >RLGM | Screened | Note 2 |
| 112 | P/S-0727 | Power Supply - AFW (E-50B) Flow Transmitter | >RLGM | Screened | |
| 113 | FIC-0749 | AFW (E-50A) Flow Indicator Controller | >RLGM | Screened | |
| 114 | FM-0749 | AFW (E-50A) Flow Monitor | >RLGM | Screened | |
| 115 | FT-0749 | AFW (E-50A) Flow Transmitter | >RLGM | Screened | |
| 116 | HIC-0749 | AFW (E-50A) Hand Indicator Controller | >RLGM | Screened | |
| 117 | I/P-0749 | Signal converter - AFW flow control valve (SG A) | >RLGM | Screened | Note 2 |
| 118 | P/S-0727A | Power Supply - AFW (E-50A) Flow Transmitter | >RLGM | Screened | |
| 119 | P/S-0206 | Power Supply - BAST T-53B Level Indication | >RLGM | Screened | |

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 120 | LIA-0206 | Boric Acid Storage Tank T-53B Level Indication | >RLGM | Screened | |
| 121 | LIT-0206 | Boric Acid Storage Tank T-53B Level Transmitter | >RLGM | Screened | |
| 122 | LIA-0208 | Boric Acid Storage Tank T-53A Level Indication | >RLGM | Screened | |
| 123 | LIT-0208 | Boric Acid Storage Tank T-53A Level Transmitter | >RLGM | Screened | Note 2 |
| 124 | P/S-0208 | Power Supply - BAST T-53A Level Indication | >RLGM | Screened | |
| 125 | LIA-0102A | PZR Level (WR) Indicator | >RLGM | Screened | |
| 126 | LT-0102 | PZR Level (WR) Transmitter | TBD | TBD | Note 3 |
| 127 | LIA-0365 | SIT T-82A Level Indication | >RLGM | Screened | |
| 128 | LM-0365 | SIT T-82A Level Monitor | >RLGM | Screened | |
| 129 | LT-0365 | SIT T-82A Level Transmitter | TBD | TBD | Note 3 |
| 130 | P/S-0365 | Power Supply - SIT T-82A Level Indication | >RLGM | Screened | |
| 131 | LIA-0368 | SIT T-82B Level Indication | >RLGM | Screened | |
| 132 | LM-0368 | SIT T-82B Level Monitor | >RLGM | Screened | |
| 133 | LT-0368 | SIT T-82B Level Transmitter | TBD | TBD | Note 3 |
| 134 | P/S-0368 | Power Supply - SIT T-82B Level Indication | >RLGM | Screened | |
| 135 | LIA-0372 | SIT T-82C Level Indication | >RLGM | Screened | |
| 136 | LM-0372 | SIT T-82C Level Monitor | >RLGM | Screened | |
| 137 | LT-0372 | SIT T-82C Level Transmitter | >RLGM | Screened | |
| 138 | P/S-0372 | Power Supply - SIT T-82C Level Indication | >RLGM | Screened | |
| 139 | LIA-0374 | SIT T-82D Level Indication | >RLGM | Screened | |
| 140 | LM-0374 | SIT T-82D Level Monitor | >RLGM | Screened | |

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 141 | LT-0374 | SIT T-82D Level Transmitter | TBD | TBD | Note 3 |
| 142 | P/S-0374 | Power Supply - SIT T-82D Level Indication | >RLGM | Screened | |
| 143 | P/S-0751A | Power Supply - SG A NR Level Indication | >RLGM | Screened | |
| 144 | P/S-0751C | Power Supply - SG A NR Level Indication | >RLGM | Screened | |
| 145 | LI-0757A | SG A WR Level Indication | >RLGM | Screened | |
| 146 | LT-0757A | SG A WR Level Transmitter | TBD | TBD | Note 3 |
| 147 | P/S-0757A | Power Supply - SG A WR Level Transmitter | >RLGM | Screened | |
| 148 | LI-0758A | SG B WR Level Indication | >RLGM | Screened | |
| 149 | LT-0758A | SG B WR Level Transmitter | TBD | TBD | Note 3 |
| 150 | P/S-0758A | Power Supply – SG B WR Level Transmitter | >RLGM | Screened | |
| 151 | LIA-2021 | CST (T-2) Level Indication | >RLGM | Screened | |
| 152 | LT-2021 | CST (T-2) Level Transmitter | >RLGM | Screened | |
| 153 | P/S-2021 | Power Supply - CST (T-2) Level Indication | >RLGM | Screened | |
| 154 | PI-0105A | PZR Pressure (WR) Indicator | >RLGM | Screened | |
| 155 | PT-0105A | PZR Pressure (WR) Transmitter | TBD | TBD | Note 3 |
| 156 | PTR-0112 | Wide Range Primary Temperature & Pressure Recorder | >RLGM | Screened | |
| 157 | PIC-0751C | SG A Pressure Indicator Controller | >RLGM | Screened | |
| 158 | PT-0751C | SG A Pressure Transmitter | TBD | TBD | Note 3 |
| 159 | PIC-0752C | SG B Pressure Indicator Controller | >RLGM | Screened | |
| 160 | PT-0752C | SG B Pressure Transmitter | TBD | TBD | Note 3 |

| Item No. | Equipment ID | Equipment Description | HCLPF (g) / Screening Level | Failure Mode | Comments |
|---|---|---|---|---|---|
| 161 | LPIR-0383 | Containment Sump Level/Pressure Indication | >RLGM | Screened | |
| 162 | P/S-1812A | Power Supply - Containment Pressure Transmitter | >RLGM | Screened | |
| 163 | PT-1812A | Containment Pressure Transmitter | >RLGM | Screened | Note 2 |
| 164 | TE-0112CC | PCS T-cold Temperature Element | TBD | TBD | Note 3 |
| 165 | TT-0112CC | PCS T-cold Temperature Transmitter | >RLGM | Screened | |
| 166 | TE-0112HC | PCS T-hot Temperature Element | TBD | TBD | Note 3 |
| 167 | TT-0112HC | PCS T-hot Temperature Transmitter | >RLGM | Screened | |
| 168 | LE-0101A | Reactor Vessel Level | TBD | TBD | Note 3 |
| 169 | LRI-0101A1 | Reactor Vessel Level Inidicator Recorder - Head Region | >RLGM | Screened | |
| 170 | LRI-0101A2 | Reactor Vessel Level Inidicator Recorder - Upper Guide Structure | >RLGM | Screened | |
| 171 | EC-11A | Post Accident Panel | >RLGM | Screened | Note 2 |
| 172 | P/S-0101AA | Power Supply for LE-0101A | >RLGM | Screened | |
| 173 | T-82A | Safety Injection Tank A | TBD | TBD | Note 3 |
| 174 | T-82B | Safety Injection Tank B | TBD | TBD | Note 3 |
| 175 | T-82C | Safety Injection Tank C | TBD | TBD | Note 3 |
| 176 | T-82D | Safety Injection Tank D | TBD | TBD | Note 3 |
| 177 | CV-0599 | TDAFW Trip/Throttle Valve | >RLGM | Screened | |
| 178 | CV-0598 | TDAFW Governor Valve | >RLGM | Screened | |

Notes:

1. Anchorage screened out based on available margin during walkdown by SRT.
2. Anchorage screened out during walkdown validation by SRT.
3. Inaccessible. Per EPRI NP-6041-SLR1, Sec. 2, Seismic Capability Walkdown, Step 5 - This component was not walked down.
4. The design of anchorage for component EP-1901 is performed for seismic load of 1xSSE in Entergy Calculation EA-EC46465-05 [51]. The maximum interaction ratio for anchor bolts is 0.23. This ratio is less than 0.5, thus margin exists such that the anchorage of panel EP-1901 is adequate for 2xSSE.
5. Lube Oil Storage Room South Block Wall is reinforced for FLEX [52].