NEXTera ENERGY SEABROOK

July 26, 2016
SBK-L-16108
Docket No. 50-443

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

Seabrook Station

NextEra Energy Seabrook, LLC Status of Required Actions for EA-12-049 Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

References:

1. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, March 12, 2012 (ML12054A735)
2. NRC Interim Staff Guidance JLD-ISG-2012-01, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0, August 29, 2012 (ML12229A174)
3. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, August 2012 (ML12242A378)
4. NextEra Energy Seabrook, LLC's Initial 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), October 26, 2012 (ML12311A013)
5. Letter SBK-L-13038, Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, (Order Number EA-12-049), February 26, 2013 (ML13063A438)
6. Letter SBK-L-13157, NextEra Energy Seabrook, LLC's First Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, (Order Number EA-12-049), August 28, 2013 (ML13247A178)

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7. Letter SBK-L-14041, NextEra Energy Seabrook, LLC's Second Six-Month Status Report in Response to the 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 27, 2014 (ML14064A188)
8. Letter SBK-L-14153, NextEra Energy Seabrook, LLC's 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 26, 2014 (ML14246A193)
9. Letter SBK-L-15025, NextEra Energy Seabrook, LLC's Fourth 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 27, 2015 (ML15068A021)
10. Letter SBK-L-15152, NextEra Energy Seabrook LLC's Request for Schedule Relaxation from NRC Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, July 23, 2015 (ML15209A581)
11. Letter SBK-L-15137, NextEra Energy Seabrook, LLC's Fifth 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 26, 2015 (ML15245A531)
12. Letter SBK-L-16011, NextEra Energy Seabrook, LLC's Sixth 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 11, 2015 (ML16048A261)
13. NRC Letter dated October 4, 2015, Seabrook Station, Unit 1 – Relaxation of the Schedule Requirements of Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (TAC No. MF0836), (ML15244A045)
14. NRC Letter dated October 4, 2015, Seabrook Station, Unit 1 – Report for the Onsite Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0836 AND MF0837), (ML15278A200)
15. NRC Letter dated March 12, 2012, 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 (ML12053A340)
16. Letter SBK-L-15089, NextEra Energy letter to NRC, dated April 28, 2015, "FLEX Strategies Phase 2 Staffing Assessment" (ML15126A281)
17. Letter SBK-L-15173, NextEra Energy letter to NRC, dated September 17, 2015, "FLEX Strategies Phase 2 Staffing Assessment" (ML 15268A407)

18. Nuclear Energy Institute, NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 2, December 2015 (ML16005A625)
19. JLD-ISG-2012-01 Rev 1, Interim Staff Guidance (ISG), January 22, 2016 (ML15357A163)

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an order (Reference 1) to NextEra Energy Seabrook, LLC (NextEra Energy Seabrook). Reference 1 was immediately effective and directed NextEra Energy Seabrook to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 required submission of an Overall Integrated Plan by February 28, 2013. The NRC Interim Staff Guidance (ISG) (Reference 2) was issued August 29, 2012 which endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 3 provides direction regarding the content of this Overall Integrated Plan.

Reference 4 provided the NextEra Energy Seabrook initial status report regarding mitigation strategies, as required by Reference 1. Reference 5 provided the NextEra Energy Seabrook Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference 1. Reference 9 provided a revised OIP updating the NextEra Energy Seabrook strategy. References 6, 7, 8, 9, 11, and 12 provided the NextEra Energy Seabrook first through sixth Overall Integrated Plan status reports. References 10 and 13 are the request and approval of schedule relaxation for implementation of Order EA-12-049. Condition C.3 of the Order required all Licensees to report to the Commission when full compliance with the requirements of the order is achieved. With the schedule relaxation, Seabrook's required compliance date is May 30, 2016.

This letter provides notification that NextEra Energy Seabrook has completed the requirements of EA-12-049 and is in full compliance with the Order for Seabrook Unit 1. The attachments to this letter provide: 1) a summary of how the compliance requirements were met, 2) the completion status for all the FLEX Open Audit items in Reference 14 and 3) the FLEX Final Integrated Plan.

Reference 15 Recommendation 9.3 required submission of an assessment of the onsite and augmented staff needed to respond to a large scale natural event. Reference 16 provided the Seabrook Station FLEX Phase 2 preliminary staffing assessment. Reference 17 provided an update to the Seabrook Station FLEX Phase 2 preliminary staffing assessment to clarify the role of Security personnel.

NEI developed and issued NEI 12-06, Revision 2 (Reference 18) which was endorsed by the NRC (Reference 19). Seabrook Station is compliant with NEI 12-06 Rev 2.

This letter contains no new regulatory commitments.

If you have any questions regarding this report, please contact Mr. Michael Ossing, Licensing Manager, at (603) 773-7512.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 26, 2016.

Sincerely,

NextEra Energy Seabrook, LLC

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Site Vice President

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Attachments

1. Seabrook Unit 1 Order EA-12-049 Compliance Requirements Summary
2. Seabrook Unit 1 FLEX Audit Open Item Closure Summary
3. Seabrook FLEX Final Integrated Plan Document

Attachment 1

Seabrook Unit 1 Order EA-12-049 Compliance Requirements Summary

STRATEGIES - COMPLETE

Seabrook Unit 1 strategies are in compliance with Order EA-12-049. There are no strategy related Open Items, Confirmatory Items, or Audit Questions/Audit Report Open Items. Attachment 2 of this correspondence provides the closure methods for all of the Seabrook Unit 1 Audit open items discussed in the Seabrook Audit Report, Reference 14.

MODIFICATIONS - COMPLETE

The modifications required to support the FLEX strategies for Seabrook Unit 1 have been fully implemented in accordance with the station design control process.

EQUIPMENT – PROCUREMENT, MAINTENANCE & TESTING - COMPLETE

The equipment required to implement the FLEX strategies for Seabrook Unit 1 has been procured and designed in accordance with NEI 12-06, Section 11.1 and 11.2, received at Seabrook, initially tested/performance verified as identified in NEI 12-06, Section 11.5, and is available for use.

Subsequent maintenance and testing will be conducted through the use of the Seabrook Preventative Maintenance program such that equipment reliability is achieved.

PROTECTED STORAGE - COMPLETE

The Seabrook Service Water Pumphouse has been modified to include storage for equipment required to implement the FLEX strategies for Seabrook Unit 1. The Seabrook Service Water Pumphouse provides protection from the applicable site hazards. The portable equipment required to implement the FLEX strategies for Seabrook Unit 1 is stored in protected locations.

PROCEDURES - COMPLETE

FLEX Support Guidelines (FSGs) for Seabrook Unit 1 have been developed and integrated with existing procedures. The FSGs and affected existing procedures have been validated and are available for use in accordance with the site procedure control program.

TRAINING - COMPLETE

Training for Seabrook Unit 1 has been completed in accordance with an accepted training process as recommended in NEI 12-06, Section 11.6.

STAFFING - COMPLETE

The staffing study for Seabrook has been completed in accordance with "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," Recommendation 9.3, dated March 12, 2012, as documented in NextEra Energy letter SBK-L-15089 letter dated April 28, 2015, "FLEX Strategies Phase 2 Staffing Assessment" (ML15126A281), and as amended by NextEra Energy letter SBK-L-15173 letter dated September 17, 2015, "FLEX Strategies Phase 2 Staffing Assessment" (ML 15268A407). The staffing study was validated and no changes to the submitted study are necessary.

NATIONAL SAFER RESPONSE CENTERS - COMPLETE

Seabrook has established a contract with Pooled Equipment Inventory Company (PEICo) and has joined the Strategic Alliance for FLEX Emergency Response (SAFER) Team Equipment Committee for off-site facility coordination. It has been confirmed that PEICo is ready to support Seabrook with Phase 3 equipment stored in the National SAFER Response Centers in accordance with the site specific SAFER Response Plan.

VALIDATION - COMPLETE

Seabrook has completed performance of validation in accordance with industry developed guidance to assure required tasks, manual actions and decisions for FLEX strategies are feasible and may be executed within the constraints identified in the Overall Integrated Plan (OIP) / Final Integrated Plan (FIP) for Order EA-12-049.

FLEX PROGRAM DOCUMENT - ESTABLISHED

The Seabrook Unit 1 Diverse and Flexible Coping Strategies (FLEX) Program document has been developed in accordance with the requirements of NEI 12-06.

Full compliance with Order EA-12-051 was achieved on November 6, 2015. With the implementation of EA-12-049, Seabrook continues to be in full compliance with Order EA-12-051.

Attachment 2

Seabrook Unit 1 FLEX Audit Open Item Closure Summary

Audit Item Reference	Subject	NRC Request	Required Action	Seabrook Response
AQ 19	Heat Tracing	The staff requested that the licensee make available a heat tracing analysis for equipment required to cope with an ELAP.	Provide a heat tracing analysis for equipment required to cope with an ELAP.	Evaluation EE-15-014, Rev. 1 (FLEX Heat Trace Evaluation, EC-285967) has been uploaded to E-Portal for review. The response to Question 19 has also been uploaded to E-Portal for review. This response discusses actions taken to address loss of heat tracing during an ELAP.
SE Review Items 14, 15, and 20	Heat-up Calculations	The staff requested the following actions regarding temperature heatup calculations and associated ventilation actions: 1. The staff requested that the control room temperature extrapolation be formally documented. 2. The staff requested that the battery rooms' temperature extrapolation for both hot and cold outside ambient conditions be formally documented. 3. The staff requested that the essential switch gear rooms' temperature extrapolation be formally documented considering the additional heat loads being added by the restoration of electric power during Phases 2 and 3 of the ELAP event. 4. The staff requested that the emergency feedwater pumphouse temperature extrapolation be formally documented. 5. The staff requested that the main steam and feedwater pipe chase's temperature extrapolation be formally documented. In addition, the staff requested that the licensee make available an evaluation of the impact of any uninsulated atmospheric steam dump valve (ASDV) piping, if the ASDVs are in service during the ELAP. The staff noted that the evaluation should include justification that the actions that need to be performed in the chases (i.e., connection of the FLEX low pressure pump	Provide requested information.	Evaluation EE-15-017, Rev. 1 (Fukushima Project ELAP Ventilation Evaluation, EC 284811) has been uploaded to E-Portal. This evaluation addresses question items 1, 2, 3, 4, and 7. Updated response to Question 15 has been uploaded to E-Portal, addressing question items 1, 2, 3, 4, and 7. Evaluation EE-15-018, Rev. 0 (MSFW Pipe Chase ELAP Ventilation Evaluation, EC284892) has been uploaded to E-Portal. This evaluation addresses question items 5 and 7. The response to Question 20 has also been uploaded to E-Portal, addressing question items 5 and 7. Calculation C-X-1-28141, Rev. 1

Audit Item Reference	Subject	NRC Request	Required Action	Seabrook Response
		to the SG feed lines) are capable of being accomplished with the conditions that will exist in those areas. Lastly, the staff requested that the licensee make available an evaluation of the environmental qualification of the ASDV nitrogen supply system. 6. The staff requested that the licensee make available the containment pressure and temperature calculation. 7. The staff requested that the licensee make available the ventilation actions (e.g., open doors, stage temporary ventilation, etc.) as a result of the heat-up calculations for the rooms listed above.		(Containment Response During ELAP – GOTHIC) has been uploaded to E-Portal. This calculation addresses question item 6.
ISE CI 3.1.1.2.A	Deployment Paths	During the audit walkdown, the staff noted non-seismic piping above the FLEX low pressure pump hose deployment path. The staff requested that the licensee make available an evaluation of the non-seismic piping over the FLEX deployment paths. This evaluation has been provided. The staff is currently reviewing the evaluation.	None Required	N/A
AQ 3	Soil Liquefaction	The staff requested that the licensee make available the soil liquefaction assessments performed on the deployment routes. The assessments have been provided. The staff is currently reviewing the information provided.	None Required	N/A
AQ 33	Non-Safety Related Equipment	The licensee indicated that the U2 piping cistern is seismically protected and made available a seismic evaluation. The staff has asked a question regarding the seismic evaluation, and the evaluation is being revised to address.	The revised seismic evaluation shall be provided to the staff.	FP100929 Rev. 1 (Unit 2 CW Supply Seismic Evaluation) has been uploaded to E-Portal for review. A supplemental response to Question 33 based on this evaluation has also been uploaded to E-Portal for review.
SE Review Item 12	Missile Protection	The licensee made available its missile protection evaluation of the Turbine Driven Emergency Feedwater Pump exhaust. The staff is currently reviewing the information provided.	None Required	N/A

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Attachment 3

Seabrook FLEX Final Integrated Plan Document

SEABROOK FLEX FINAL INTEGRATED PLAN DOCUMENT

SEABROOK STATION UNIT 1

Table of Contents

1. Introduction

In 2011, an earthquake-induced tsunami caused Beyond-Design-Basis (BDB) flooding at the Fukushima Dai-ichi Nuclear Power Station in Japan. The flooding caused the emergency power supplies and electrical distribution systems to be inoperable, resulting in an Extended Loss of Alternating current Power (ELAP) in five of the six units on the site. The ELAP led to (1) the loss of core cooling, (2) loss of Spent Fuel Pool (SFP) cooling capabilities, and (3) a significant challenge to maintaining containment integrity. All direct current (DC) power was lost early in the event on Units 1 & 2 and after some period of time at the other units. Core damage occurred in three of the units along with a loss of containment integrity resulting in a release of radioactive material to the surrounding environment.

The US Nuclear Regulatory Commission (NRC) assembled a Near-Term Task Force (NTTF) to advise the Commission on actions the US nuclear industry should take to preclude core damage and a release of radioactive material after a natural disaster such as that seen at Fukushima. The NTTF report [Ref. 6.1] contained many recommendations to fulfill this charter, including assessing extreme external event hazards and strengthening station capabilities for responding to Beyond-Design-Basis External Events (BDBEEs). NRC Order EA-12-049 [Ref. 6.2] was subsequently issued to implement these recommendations including installation of reliable SFP Instrumentation, the scope of which was mandated separately under NRC Order EA-12-051 [Ref. 6.3].

This Final Integrated Plan document provides a report on how those recommendations have been met and is formally maintained to ensure changes in the Seabrook Station BDBEE response that are implemented under the governing Seabrook Station Program [Ref. 6.4] maintain compliance with the NRC Order [Ref. 6.2].

2. Regulatory Evaluation

2.1. Order EA-12-049

Based on NTTF Recommendation 4.2, the NRC issued Order EA-12-049 [Ref. 6.2] on March 12, 2012 to implement mitigation strategies for BDBEEs. The order provided the following requirements for strategies to mitigate BDBEEs:

1. Licensees shall develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a BDBEE.

2. These strategies must be capable of mitigating a simultaneous loss of all AC power and loss of normal access to the Ultimate Heat Sink (UHS) and

have adequate capacity to address challenges to core cooling, containment and SFP cooling capabilities at all units on a site subject to the Order.

3. Licensees must provide reasonable protection for the associated equipment from external events. Such protection must demonstrate that there is adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities at all units on a site subject to the Order.

4. Licensees must be capable of implementing the strategies in all modes.

5. Full compliance shall include procedures, guidance, training, and acquisition, staging or installing of equipment needed for the strategies.

NRC Order EA-12-049 [Ref 6.2] required licensees of operating reactors to submit an Overall Integrated Plan (OIP), including a description of how compliance with these requirements would be achieved by February 28, 2013. The Order also required licensees to complete implementation of the requirements no later than two refueling cycles after submittal of the OIP on December 31, 2016, whichever comes first. For Seabrook this was originally November 2015. Due to the addition of a separate set of strategies in addition to those proposed in the original OIP submittal, schedule relaxation to May 30, 2016 was requested and granted [Ref. 6.5 and 6.6].

NRC Order EA-12-049 established the requirements for mitigation strategies following a BDBEE. The industry guidance for the order, Nuclear Energy Institute (NEI) NEI 12-06, Revision 0 (Ref. 6.79) and Revision 2 (Ref. 6.80), as endorsed by NRC staff in Japan Lessons-Learned Directorate (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-01 Revision 0 (Ref. 6.81) and Revision 1 (Ref. 6.82), sets forth a method of complying with the order.

Seabrook Station complies with NEI 12-06 Revision 2.

Seabrook Station submitted its OIP [Ref. 6.7] and provided updates [Refs. 6.8, 6.9, 6.10, 6.11, 6.12, 6.13] describing changes in the plan and the status of analyses, physical modifications, procedure development and staff training required to implement the plan.

2.2. Order EA-12-051

NRC Order EA-12-051 [Ref 6.3] required licensees to install reliable SFP instrumentation with specific design features for monitoring SFP water level. This order was prompted by NTTF Recommendation 7.1 [Ref. 6.1].

NEI 12-02 [Ref. 6.14] provided guidance for compliance with Order EA-12-051 [Ref. 6.3]. The NRC determined that, with the exceptions and clarifications provided in JLD-ISG-2012-03 [Ref. 6.15], conformance with the guidance in NEI 12-02 is an acceptable method for satisfying the requirements in Order EA-12-051.

Seabrook Station submitted its OIP with regard to reliable SFP instrumentation [Ref. 6.16] and provided updates [Refs. 6.17, 6.18, 6.19, 6.20, 6.21] describing changes in the plan and the status of analyses, physical modifications, procedure development and staff training required to implement the plan.

3. Technical Evaluation of Order EA-12-049

3.1. Overall Mitigation Strategy (Three Phases)

The objective of the FLEX strategies is to establish an indefinite coping capability in order to 1) prevent damage to the fuel in the reactors, 2) maintain the Containment function and 3) maintain cooling and prevent damage to fuel in the spent fuel pool (SFP) using installed equipment, on-site portable equipment, and pre-staged off-site resources. This indefinite coping capability addresses an ELAP – loss of off-site power, emergency diesel generators and any station blackout credited alternate AC source, but not the loss of AC power to buses fed by station batteries through inverters – with a simultaneous Loss Ultimate Heat Sink (LUHS). This condition could arise following external events that are within the existing design basis with additional failures and conditions that could arise from a Beyond-Design-Basis external event.

The plant indefinite coping capability is attained through the implementation of pre-determined strategies (FLEX strategies) that are focused on maintaining or restoring key plant safety functions. The FLEX strategies are not tied to any specific damage state or mechanistic assessment of external events. Rather, the strategies are developed to maintain the key plant safety functions based on the evaluation of plant response to the coincident ELAP/LUHS event. A safety function-based approach provides consistency with, and allows coordination with, existing plant emergency operating procedures (EOPs). FLEX strategies are implemented in support of EOPs using FLEX Support Guidelines (FSGs).

The strategies for coping with the plant conditions that result from an ELAP/LUHS event involve a three-phase approach:

- Phase 1 – Initially cope by relying on installed plant equipment and on-site resources.
- Phase 2 – Transition from installed plant equipment to on-site FLEX equipment.
- Phase 3 – Obtain additional capability and redundancy from off-site equipment and resources until power, water, and coolant injection systems are restored.

Seabrook Station is a 4-loop Westinghouse Pressurized Water Reactor located on the New Hampshire seacoast. The FLEX Phase 2 strategy consists of a primary strategy which utilizes two unique installed features of Seabrook Station, and a backup strategy which utilizes a full set of portable FLEX equipment.

In the primary strategy, at least one of two available Supplemental Emergency Power System (SEPS) diesel generator sets, not credited in the blackout analysis, provide rapid re-powering of an emergency bus. The installed Seismic Category I Service Water Cooling Tower (SWCT) is then able to provide an alternate UHS. The SWCT is protected from seismic, flooding and severe weather events but is not fully protected from all wind driven missiles. The SEPS is protected against severe weather (except hurricane/tornado missiles and flooding). SEPS has been modified to harden it for seismic events. The SEPS and the SWCT together provide an optimum response for seismic events or any event that does not result in a loss of the SEPS or SWCT (e.g., due to a wind generated missile). Flooding of SEPS electrical equipment will be addressed in the Integrated Flooding Assessment (Ref. 6.85). Refer to Addendums 1 and 2 for more information on SEPS and the SWCT.

The Seabrook Phase 2 strategies meet the intent of NEI 12-06 by having two diverse sets of strategies that can be used to fulfill the required functions (N and N+1). The primary strategy deviates from NEI 12-06 in that the SEPS and SWCT are not fully protected from all hazards. The SEPS and SWCT are available following Design Basis flooding, seismic, and hot/cold weather events, but may not be available following severe wind/wind driven missile events. However, the SWCT provides protection of the SEPS from wind driven missiles from the north, reducing the probability that wind driven missiles will damage SEPS. The SWCT is a robust, seismically designed reinforced concrete structure that was not originally evaluated for tornado missile impact. The SWCT also has openings that make it potentially vulnerable to vertical and oblique trajectory missiles. However, these openings limit the pathways for wind driven missiles to damage SWCT equipment. If either the SEPS or the SWCT are not available, a set of fully protected portable FLEX equipment is available that can be deployed to fulfill all required functions. For strategies using the portable FLEX equipment, primary and alternate connections points are available.

The portable FLEX equipment for the backup strategies is stored in an existing Seismic Category I, missile protected structure located above the maximum Design Basis flood elevation, thus providing reasonable assurance that that the portable FLEX equipment will remain deployable following a BDBEE. The portable FLEX equipment consists of:

- FLEX Low Pressure Pump (FLPP)
- FLEX High Pressure Pump (FHPP)
- Cooling Tower Makeup Pump (existing)
- FLEX Submersible Pump
- 480 V 405 kW Generator

- 480V 30 kW Generator
- Powered self-propelled trailer mover (tugger)
- Tow vehicle/debris removal tractor
- Debris removal equipment
- Refueling cart
- FLEX hoses, cabling and connections
- Portable Light Towers

Taken together, the primary and secondary Phase 2 strategies meet the intent of Section 7.3 of NEI 12-06, in that no one external event can reasonably fail the site FLEX capability (N).

The duration of Phases 1, 2, and 3 is specific to the installed and portable equipment utilized for the particular FLEX strategy employed to mitigate the plant condition. The primary strategy using SEPS/SWCT results in a rapid transition to Phase 2 as an emergency AC bus is restored early in the event.

The sequence of events for Seabrook during Modes 1-5 with Steam Generators (SGs) available is tabulated in Table 1 (SEPS available) and Table 2 (SEPS not available). Reference the FLEX Validation Report in the DFCS for more information [Appendix H of Ref. 6.4]. See Section 3.11 of this document for scenarios involving plant modes without SGs available.

Table 1 Integrated FLEX Strategy Timeline – SEPS Available - SGs Available

Item #	Task	Estimated Start Time (hrs.)[1]	Time Constraint (hrs.)[1]	Level of Validation
1	Event Initiation	0	N/A	N/A
2	Declare ELAP	0	1	A
3	Commence RCS Boration	0	2	A
4	Commence RCS Cool Down	0	2	A
5	Notify SAFER Control Center	0	1	N/A
6	Complete SEPS Load Reduction	N/A	N/A	N/A
7	Complete RCS Boration	2	8.5	B
8	Debris removed and ERO Augmented Staff Arrives	0	6	N/A
9	Place Residual Heat Removal (RHR) in Service	6	9	B
10	Place Spent Fuel Cooling in Service	7	12	B
11	Refuel SEPS Engines	8	20	B

[1]The Estimated Start Time and Time Constraint values are measured from event initiation.

Table 2 Integrated FLEX Strategy Timeline – Without SEPS - SGs Available

Item #	Task	Estimated Start Time (hrs.)[1]	Time Constraint (hrs.)[1]	Level of Validation
1	Event Initiation	0	N/A	N/A
2	Declare ELAP	0	1	A
3	Complete DC Bus Load Shedding for at Least One Vital Bus	0	2	A
4	Open Control Room Doors	0	4	A
5	Notify SAFER Control Center	0	1	N/A
6	Pre-Stage Spent Fuel Makeup Equipment	3	6	A
7	Commence RCS Cool Down	2	10	B
8	Debris removed and ERO Augmented Staff Arrives	0	6	N/A
9	Restore Power to MCC-111 and 231	6	8	B
10	Restore Power to Vital Battery Charger	6	8	B
11	Commence RCS Boration	7	10	B
12	Commence CST Makeup	9	11	B
13	Complete RCS Cooldown	8	13.1	B
14	Commence SFP Makeup	15	19	B
15	Complete RCS Boration	10	22	B

[1]The Estimated Start Time and Time Constraint values are measured from event initiation.

The strategies described below are capable of mitigating an ELAP/LUHS resulting from a BDBEE event by providing adequate capability to maintain core cooling, containment, and SFP cooling capabilities. Though specific strategies have been developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety are incorporated into the Seabrook EOP in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit is evaluated under 10 CFR 50.59.

3.2. Reactor Core Cooling Strategies

The initial FLEX strategy for reactor core cooling and decay heat removal is to release steam from the Steam Generators (SGs) using the Atmospheric Steam Dump Valves (ASDVs) or Main Steam Safety Valves with the addition of a corresponding amount of feedwater to the SGs via the Turbine Driven Emergency Feedwater (TDEFW) pump. A motor driven emergency feedwater (EFW) pump will also be available, with SEPS operating, as soon as SEPS repowers the B Train emergency bus (the preferred bus; the A Train bus does not power the motor driven EFW pump). Backup is provided by the FLEX LP Pump and connected hoses and fittings. The EFW system includes the Condensate Storage Tank (CST) as the initial water supply to the TDEFW pump. The initial RCS cooldown will be completed prior to depletion of the initial CST inventory.

DC bus load shedding will ensure battery life is extended to at least 12 hours [Ref 6.22]. Either the SEPS or a portable FLEX 480V generator will repower the battery chargers prior to battery depletion to ensure continued availability of the essential instrumentation.

3.2.1. Phase 1 Strategy

The plant trips due to a loss of offsite power caused by the BDBEE. For a BDBEE with significant warning such as a hurricane or severe winter storm it is also possible that the plant will already be shutdown to Mode 3, 4 or 5 in accordance with severe weather condition procedures.

In accordance with the event assumptions contained in NEI 12-06, neither Emergency Diesel Generator is available to respond to the event. The operating crew will attempt to manually start the EDGs which are assumed to be unsuccessful. Immediately following the loss of power, the reactor will trip and the plant will initially stabilize at no-load reactor coolant system (RCS) temperature and pressure conditions, with reactor decay heat removal via steam release to the atmosphere through the steam generator safety valves and/or SG ASDVs. Natural circulation of the RCS through the SGs will develop to provide core cooling, and the turbine-driven emergency feedwater (TDEFW) pump will provide flow from the CST to the steam generators to make-up for steam release.

The TDEFW pump is automatically actuated to provide feedwater to the steam generators for the removal of reactor core decay heat. The TDEFW pump supplies flow to all four steam generators through individual motor-operated flow control valves. Feedwater supply for the TDEFW pump is from a Seismic Category I portion of the CST. The CST provides sufficient protected inventory to meet Phase 1 and Phase 2 requirements (15 hours); [Ref. 6.23].

SG steam pressure is controlled by the atmospheric dump valves (ASDVs). The ASDVs are air operated valves. If control air is not available, permanently installed backup nitrogen bottles connected to the control air lines and located within the Category I structure can be used to stroke the valves. The ASDVs also have handwheels, allowing manual operation.

Operators will respond to the event in accordance with emergency operating procedures (EOPs) to confirm RCS, secondary system, and Containment conditions. A transition to ECA-0.0 “Loss of All AC Power” [Ref. 6.24] will be made upon the diagnosis of the total loss of AC power. This procedure directs isolation of RCS letdown and sampling pathways, ensures the pressurizer Power Operated Relief Valves are closed, and confirms cooling water flow to the SGs. It next attempts to repower the AC emergency buses. The Operating crew will make a determination within 1 hour whether or not the emergency AC busses can be returned within the Station Blackout (SBO) coping time of 4 hours.

If SEPS is capable of powering an emergency bus, but the bus cannot be powered from offsite or an emergency diesel generator within the SBO coping time of 4 hours, then FLEX Support Guideline FSG-0.0 "Extended Loss of All AC Power With SEPS" is entered.

If no emergency bus can be powered from any source, including SEPS, then ECA-0.0 directs further actions to disable automatic equipment loading, open control room cabinet doors, and isolate RCP seal injection and return. If it is determined that power cannot be restored to an emergency bus from an emergency diesel generator or offsite power within the SBO coping time of 4 hours, entry into FSG-0.1 "Extended Loss of All AC Power Without SEPS" is directed.

The operating crew will confirm that an ELAP event is in progress either through visual observation of physical damage to the station switchyard and emergency diesel generators or via information obtained from the electrical grid load dispatcher, Operations and /or Security Force.

Phase 1 Strategy - SEPS or SWCT Available

Both of the SEPS generators are assumed to start automatically as designed and run in standby until manually connected to an emergency AC Bus. Only one of two SEPS generators is required to repower an emergency bus. If necessary, the SEPS generators can also be started manually from the digital control panel in the Train B Essential Switchgear Room or locally from the digital control panels in each generators enclosure.

With an emergency bus energized, a centrifugal charging pump, a thermal barrier cooling water pump, a Primary Component Cooling Water (PCCW) pump, the motor-driven EFW pump, and an ocean Service Water pump or a cooling tower pump are started by the Emergency Power Sequencer. The operating crew will then shut down the motor-driven EFW pump if running and if the turbine-driven emergency feedwater pump is verified running.

If it is determined that the AC buses will not be returned within 4 hours, then an ELAP will be declared and a transition made to the FLEX strategy guidelines (FSGs). Transition to RHR cooling will proceed in Phase 2 with the SEPS/SWCT available.

Phase 1 Strategy - SEPS and SWCT Unavailable

SEPS and the SWCT are not protected from wind driven missiles. In a high wind tornado or hurricane event, a wind driven missile could disable either or both the SEPS and SWCT.

Core cooling is accomplished by natural circulation of the RCS through the SGs. All SGs are supplied with makeup water from the CST via the turbine-driven EFW pump and steamed by ASDVs to provide a symmetric cooldown that avoids stagnant RCS loops. Avoidance of stagnant legs is important to maintaining RCP seal temperatures and promoting boron mixing within the RCS.

If it is determined that the AC buses will not be returned within 4 hours, then an ELAP will be declared and a transition made to the FSGs. Maximum EFW flow is maintained until SG level is greater than 65% wide range in at least two SGs or 6% narrow range in at least one SG. At that point, feed flow is controlled by local operation of the EFW throttle valves and the EFW pump mini-flow valve. With the mini-flow valve open, approximately 270 gpm will be returned to the CST.

The lower portion of the CST (approximately 194,000 gallons usable volume) is protected from seismic and missile events and will provide a coping time of at least 15 hours [Ref. 6.23]. No RCS makeup is required for Phase 1 due to installation of the Westinghouse SHIELD® low leakage passive shutdown RCP seals which reduce RCS leakage to less than 5 GPM.

Following an ELAP/LUHS event, RCS cooldown will be initiated at approximately 75°F/hr. using the ASDVs, to a SG pressure of 350 psig.

Station batteries are adequate for coping for at least 12 hours with load reduction within 2 hours of event initiation.

RCS – Per FSG-0.1 (Ref. 6.28). RCS cooldown will be initiated within the first ten hours following a BDBEE that initiates an ELAP/LUHS event. The RCS cooldown rate will be approximately 75°F/hr. via the ASDVs, to a SG pressure of approximately 350 psig. RCS inventory will be maintained during the Phase 1 RCS cooldown as a result of Safety Injection Accumulator (SI Accumulator) injection. The makeup from the SI Accumulators replaces the RCS volume displaced by RCS leakage and RCS shrinkage (Ref. 6.33). To ensure that RCS Accumulator injection does not continue to the extent that its nitrogen enters the RCS, initial RCS cooldown will be terminated at a SG pressure of 350 psig and this pressure maintained until the SI Accumulators are isolated in Phase 2.

Electrical/Instrumentation – Load shedding of non-essential loads from the vital DC buses would be completed approximately 2 hours after the ELAP/LUHS event initiation. This action, along with swapping the supply of the more loaded vital DC bus to the more lightly loaded battery in the same train, results in a coping time of 12 hours [Ref. 6.22]. DC electrical train alignment is performed by FSG-4.

3.2.2. Phase 2 Strategy

<u>Phase 2 Strategy - SEPS and SWCT Available</u>

Seabrook Station's Phase 2 coping response with SEPS and SWCT available begins when an emergency AC bus is re-powered from SEPS. RCS cooling will be maintained by feeding the SGs from the CST using the TDEFW pump while steaming to the atmosphere via the ASDVs on each main steam line. The TDEFW pump is assumed to provide EFW flow to all four SGs with water from the CST. If the TDEFW pump is not available, and the B Train Emergency Bus is powered, the Motor Driven EFW Pump (MDEFW Pump) can be placed in service to feed the SGs. The RCS will be cooled down in order to transition to RHR cooling. During RCS cool down, a rapid boration is required to achieve Cold Shutdown boron concentration. This requires opening the rapid boration valve (CS-V426) to provide 7000 ppm boric acid to the charging pump suction from the Boric Acid Storage Tanks (BATs). CS-V426 can be opened locally if needed. This path includes the two BATs and two 100% capacity installed boric acid makeup pumps (one of which will have power from the energized Emergency Bus).

An alternate available borated water source is the Refueling Water Storage Tank (RWST) which is aligned to the charging pump suction. If a rapid boration is not available, the charging pump suction will draw borated water from the RWST. The Seabrook Station Phase 2 strategy with SEPS available is to commence boration coincident with cooldown no later than 2 hours post-ELAP.

The SI accumulators are also allowed to inject borated water for reactivity control and inventory control. At RHR entry conditions the SI accumulator outlet valves will be closed to prevent nitrogen injection to the RCS. The permanently installed SI accumulator outlet valves will be available once repowered from the Emergency Bus powered by SEPS. Two of the valves will be powered directly from the energized emergency bus; the other two (opposite train) valves will be powered from the energized bus using pre-made temporary cables. The SI accumulator outlet valves are EQ items, qualified for the harsh containment environment following a design basis accident, which bounds the non-LOCA ELAP analysis.

The charging pump borated water suction flowpath from the safety-related BATs is fully protected from all external hazards applicable to Seabrook (seismic, flood, high winds and associated wind-driven missiles and extreme temperatures). All components are located indoors inside the seismic Category I Primary Auxiliary Building. The charging pump motors are qualified for harsh environment. EC284811 shows the normal to adverse temperature of 200°F is never exceeded in the 120 hours calculated transient time, and no equipment qualification limits are challenged.

The charging suction flowpath from the safety-related RWST is fully protected from all external hazards with the exception of the top portion of the RWST which is not fully protected from wind-driven missiles.

The charging pump discharge flowpath to the RCS is from the charging pump discharge to the RCS loop 1 cold leg. This path includes the two 100% capacity charging pumps on each unit (one of which will have power from the energized Emergency Bus), the regenerative heat exchanger, and associated piping and valves. This discharge flowpath is fully protected from all external hazards applicable to Seabrook (seismic, flood, high winds and associated wind-driven missiles and extreme temperatures). All components are located indoors inside the seismic Category I Primary Auxiliary Building and reactor containment building.

The early cool down to an RCS temperature less than 350°F and RCS pressure less than 360 psig ensures that Residual Heat Removal (RHR) can be placed in operation prior to expending the available water volume in the CST. NEI 12-06 assumes the loss of normal access to the Ultimate Heat Sink. Consequently, Seabrook Station will rely on the SWCT as a backup ultimate heat sink. The heat sink will be restored by ensuring a cooling tower pump and fan are running after the emergency AC bus is re-energized, to restore flow in the Service Water System. The Service Water System cools the PCCW system, which in turn provides cooling water to safety related equipment including the RHR pump, RHR heat exchanger, SFP heat exchanger, RCP Thermal barrier cooling loop. PCCW system temperature is controlled by air-operated temperature control and bypass valves which are provided with a nitrogen backup supply in the event that control air pressure is lost. If necessary, these valves can also be operated locally in the Primary Auxiliary Building by a field operator.

Once RCS temperature and pressure have been reduced to RHR system operating conditions, the RHR system will be placed in service to continue the RCS cool down to Mode 5. The RHR system will be used to maintain the RCS in Mode 5 for long-term coping.

During Phase 2 with SEPS available, the FLEX 405kW generator is deployed in the event that the running SEPS engine fails. Other FLEX equipment may be deployed as needed to support the FLEX SEPS strategies or as backup equipment.

The RCS cooldown is started within 2 hours of event initiation and, RHR entry conditions are achieved within 9 hours of event initiation. This ensures that cooldown is complete before CST refill is needed.

The operating crew will perform equipment electrical alignments that ensure emergency bus loading is within the capacity of one SEPS genset (2640 KW net). This ensures that if one genset automatically shuts down for some reason, the remaining unit will not be overloaded.

The operating crew will also evaluate refueling strategies for the SEPS gensets relatively early in the event to ensure an adequate supply of fuel is maintained.

RCS - RCS cooldown will be initiated within the first 2 hours following a BDBEE that initiates an ELAP/LUHS event, and will reach RHR entry conditions within 9 hours of ELAP event initiation. The RCS cooldown rate will be less than 75°F/hr. To perform this cooldown, the SG ASDVs will be used to depressurize the SGs to a pressure of 350 psig [Ref. 6.26]. At this point the accumulators will be isolated and a transition to RHR cooling will be performed.

Electrical/Instrumentation – One train of electrical distribution is powered by SEPS in this scenario. Load stripping of all non-essential loads from the vital DC buses whose battery chargers are not being powered by the SEPS is not a time sensitive action since the energized train's vital DC buses are available. Completing load stripping within 2 hours of event initiation, along with swapping the supply of the more loaded vital DC bus to the more lightly loaded battery in the same train (required on train B only), will result in a coping time of 12 hours for the bus that does not have its battery charger powered (the other bus has continuous charging and unlimited coping time) [Ref. 6.22].

Phase 2 Strategy - SEPS and SWCT Unavailable

RCS core cooling and heat removal will be maintained while performing a cooldown and depressurization of the RCS to achieve RHR entry conditions. Several actions are required during Phase 2 for reactor core cooling. The main strategy is dependent upon the continual operation of the TDEFW pump, which is capable of feeding the steam generators provided there is an ample steam supply to drive the TDEFW pump turbine.

As a baseline capability for reactor core cooling for Phase 2, a portable diesel driven pump (FLPP) will be deployed for injection into the steam generators in the event that the TDEFW pump fails. Implementing this contingency requires depressurizing the steam generators to allow for makeup with the FLPP. To allow for defense-in-depth actions in the event of an unforeseen failure of the TDEFW pump, the FLPP for the Phase 2 core cooling will be staged and made ready as resources are available following the BDBE event. The FLPP will be staged at a location near the CST. A connection point is provided for supplying the FLPP suction from the CST, the preferred source (Figure 1). FLPP suction can also be supplied from other water sources, including the

Unit 2 Circulating Water Piping Cistern which is protected against all hazards and whose water quality and quantity are sufficient for steaming the generators without significant loss of heat transfer from tube fouling until at least 72 hours after the event initiation [Ref. 6.23, 6.27]. The discharge from the FLPP Pump will feed into the TDEFW pump discharge header (Figure 1), or, alternatively, to drains on the main feedwater headers (Figure 2). Both connection points are protected against all hazards.

Figure 1: Connections for FLEX LP Pump Discharge to EFW Pump Discharge Line

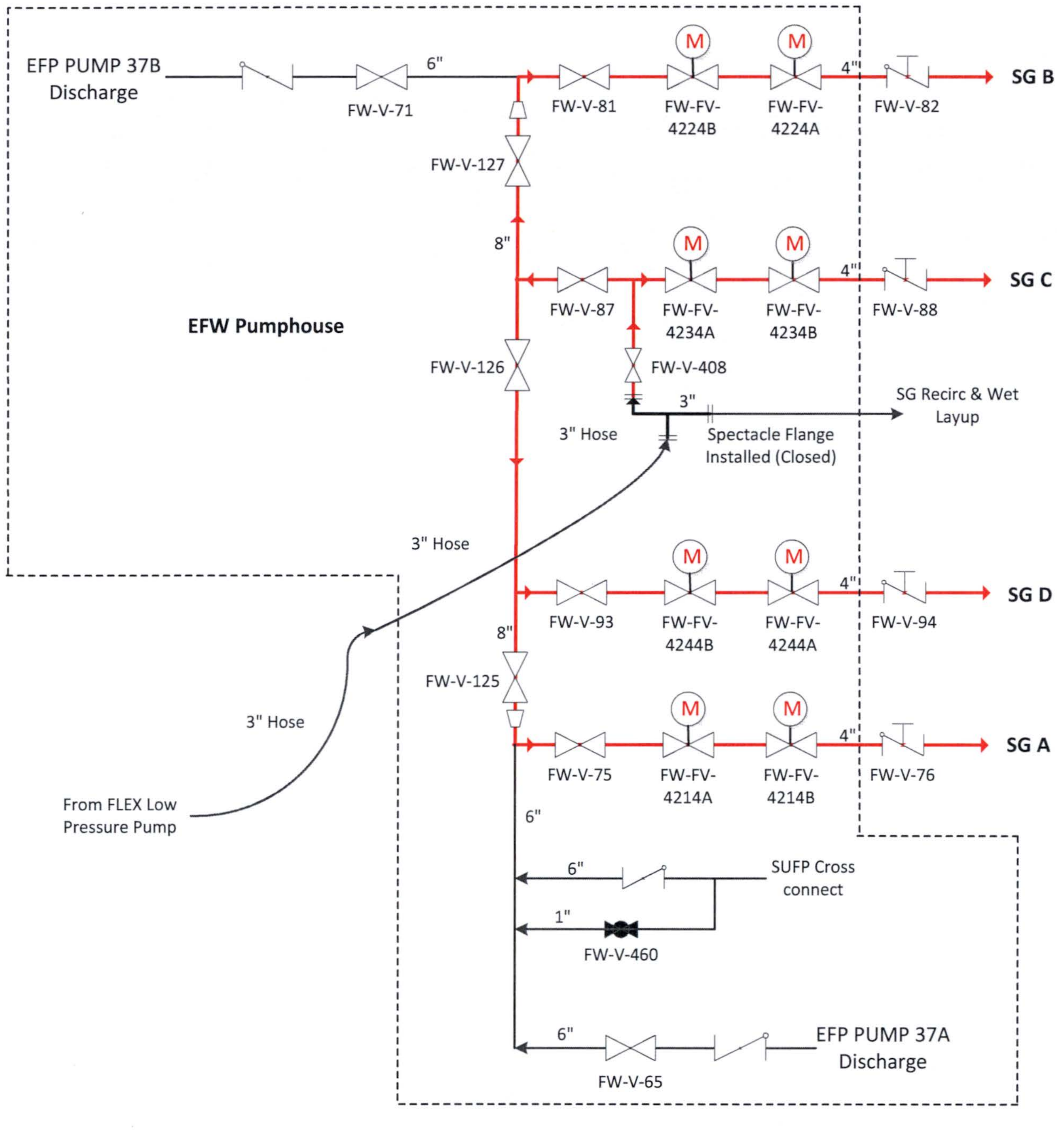
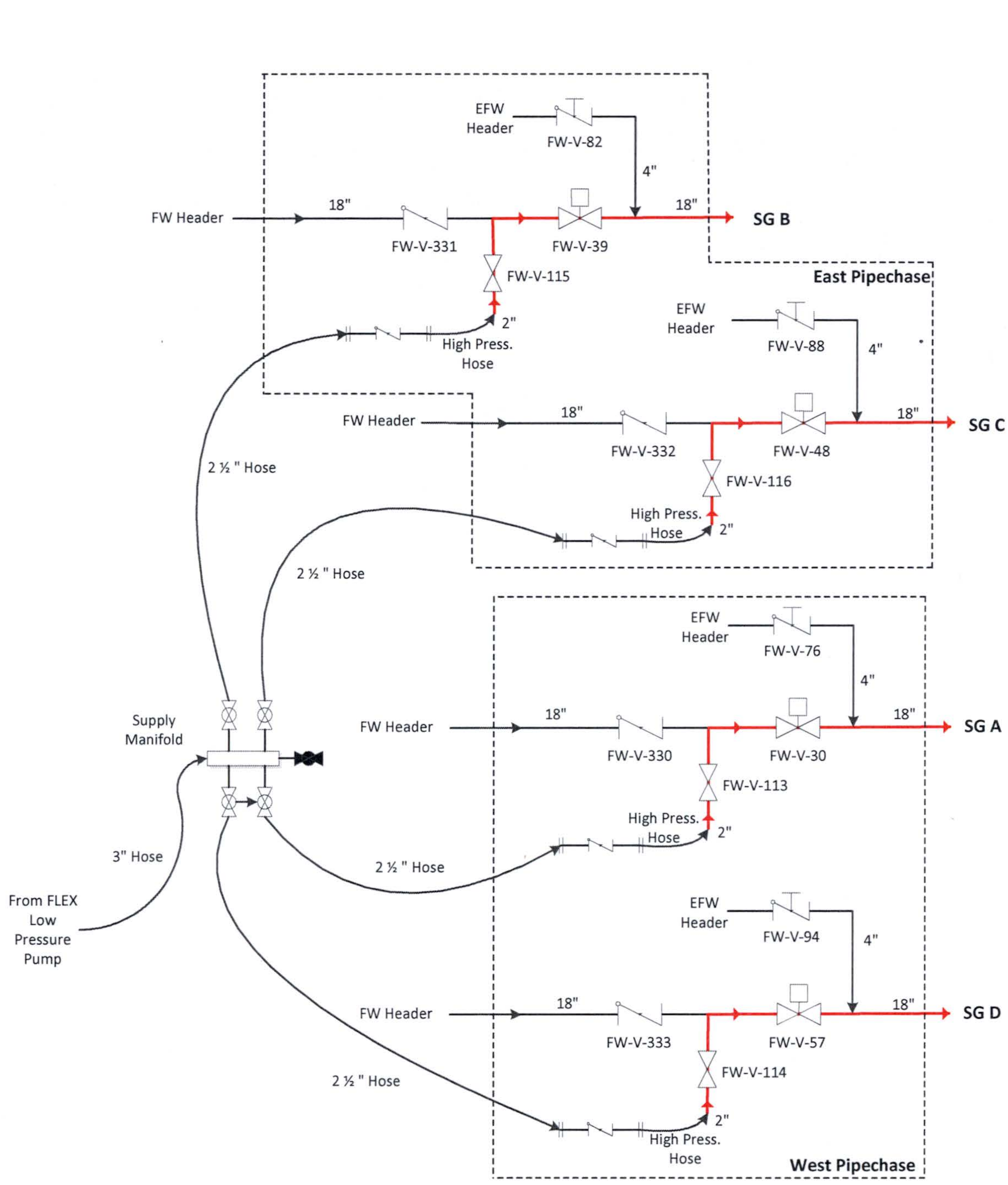


Figure 2: Connections for FLEX LP Pump Discharge to Main Feed Line Drains



A CST makeup capability will be deployed in Phase 2 to restore inventory to the CST prior to inventory depletion. There are a number of sources available for this makeup (see Table 3). Makeup may be provided in a number of ways, including directly from the Demineralization Water Storage Tanks via a piped connection (preferred), from the Fire Protection System via a fire hydrant, or pumped from the Demineralization Water Tanks, Fire Water Tanks, or the Unit 2 Circulating Water Piping Cistern. The Unit 2 Circulating Water Piping Cistern is protected against all hazards, and has a water quality/quantity sufficient for steaming the generators without loss of heat transfer from tube fouling until at least 72 hours after the event initiation. CST makeup connections are located in the Turbine Building and the EFW Pump House.

Table 3 – Water Sources for FLEX LP Pump

Rank	Capacity (gal)	Conservative Minimum Useable Volume (gal)	Source	Seismic protected	Missile protected	Water Quality
1	400,000	194,000	CST	Y	Y	Demin
1	700,000	297,000 total	Demin Water Storage Tanks	N	N	Demin
2	824,000	824,000[1]	Unit 2 Circulating Water Piping Cistern	Y[2]	Y	Potable
2	1,000,000	904,000 total	Fire Water Tanks	N	N	Potable

[1]Approximately 799,000 gallons of the 824,000 gallons are seismic and missile protected.
[2] The Unit 2 Circulating Water Piping Cistern and access vault were determined to be seismically robust in Ref. 6.53. The primary mode of failure for the pipe that comprises the cistern is relative displacement
at the joint between two segments of pipe. The evaluation showed that the relative displacement of the piping at the piping joints induced in a seismic event can be easily accommodated by the overlapping joint interface.

During Phase 2, a FLEX 480V Diesel Generator will be deployed, staged and connected to repower a station 480 VAC bus to ensure power is available to a portable battery charger for battery charging, DC control power and instrumentation. Backup instrumentation readings can also be accessed in the main control room or locally at the containment penetration if required. The Westinghouse SHIELD low leakage RCP seals limit RCS leakage such that RCS makeup should not be required for the Phase 2 duration; however, the FHPP is available to provide injection from the Boric Acid Tanks (BATs). RCS boration is required within Phase 2 and is accomplished with the FHPP taking suction on the BATs. The Seabrook Station Phase 2 strategy is to commence boration coincident with cooldown no later than 10 hours post-ELAP.

SFP makeup will be provided by gravity drain from the RWST. The alternate makeup strategy uses the FLEX Submersible Pump and water from the Unit 2 Circulating Water Piping Cistern (below grade and protected from all hazards) pumped directly into the SFP.

RCS - RCS cooldown will be initiated within 10 hours following a BDBEE that initiates an ELAP/LUHS event, and will reach RHR entry conditions within 13.1 hours of ELAP event initiation. The RCS cooldown rate will be less than 75°F/hr. To perform this cooldown, the SG ASDVs will be used to depressurize the SGs to a pressure of 350 psig [Ref. 6.28]. At this point the accumulators will be isolated and the RCS maintained at a temperature of about 350°F and pressure less than 360 psig until a transition to RHR cooling will be performed. This will occur once the National SAFER Response Center (NSRC) equipment has been received and deployed.

The permanently installed SI accumulator outlet valves will be available once repowered from the FLEX 480VAC Diesel Generator via pre-made cables stored local to their deployment area. Closure of these valves will be performed to prevent nitrogen injection into the RCS during subsequent RCS depressurization and cooldown. The SI accumulator outlet valves are EQ items, qualified for the harsh containment environment following a design basis accident.

Boration will be performed using the diesel-driven FHPP, drawing suction from the BATs or the RWST, and discharging into the RCS via either the charging header or the Safety Injection header. Primary and alternate suction and discharge connections for the FHPP are discussed in section 3.2.4.1.1.

Electrical/Instrumentation – In order to ensure that the batteries remain available until the FLEX 480 VAC Diesel Generator is operational, manual load shedding will be used. Completing load stripping within 2 hours of event initiation, along with swapping the supply of the more loaded vital DC bus to the more lightly loaded battery in the same train (required on train B only), will result in a coping time of 12 hours) [Ref. 6.22].

3.2.3. Phase 3 Strategy

<u>Phase 3 Strategy - SEPS and SWCT Available</u>

In this scenario the NSRC equipment delivered for phase 3 becomes a backup to the SEPS. The plant will already be on shutdown cooling using the RHR system and the SWCT as a backup UHS. RCS makeup will be continued in Phase 3 using the same strategies employed for Phase 2.

Phase 3 Strategy - SEPS and SWCT Unavailable

Phase 3 strategies for all modes of RCS cooling will be to establish Shutdown Cooling (SDC) which will require an NSRC pumping system capable of cooling the PCCW Heat Exchanger that in turn cools the RHR Heat Exchanger, and NSRC 4.16 KVAC generators to power a PCCW pump and an RHR pump. The NSRC low pressure high flow (LPHF) pump and submersible booster pumps will be used to restore the UHS. The submersible pump heads will be placed in the Service Water forebay, located inside the Seismic Category I SWPH, and will supply the LPHF pump. The LPHF pump will discharge into the Service Water (SW) pump A/C discharge header, which can be fed to either SW loop. With SW cooling restored, the plant can then be placed on shutdown cooling using the repowered RHR and PCCW pumps. The NSRC pumping system will provide a minimum of 5,000 gpm to the PCCW heat exchanger through the Service Water system. This flow was evaluated as adequate for the RCS heat load present in an ELAP/LUHS event [see Attachment 7.4 to Ref. 6.29].

Temporary power cables will be supplied with the NSRC generators for connection to the Class 1E Buses using the primary or alternate connections. The two 1 MW 4160V generators will be connected to Bus E6 (Train B) or Bus E5 (Train A) via the corresponding SEPS supply breaker to energize AC loads required to maintain safe shutdown and core cooling indefinitely. Additionally, one 1 MW 480V generator will be connected to Unit Sub E63 (Train B) or Unit Sub E53 (Train A) to provide power to safety related support systems. RCS makeup will be continued in Phase 3 using the same strategies employed for Phase 2.

3.2.4. Reactor Core Cooling Strategies Evaluation

3.2.4.1. Systems, Structures and Components (SSCs) Availability

3.2.4.1.1. Permanent Plant SSCs

With the exception of the SEPS gensets, SWCT and supporting switchgear, the equipment described to support FLEX Strategies is all located in flood and missile protected structures and is seismically qualified.

- Turbine Driven Emergency Feedwater (TDEFW) Pump

  The TDEFW pump will automatically start and will deliver flow to the steam generators following an ELAP/LUHS event. Two air operated valves, one from each of the A and B main steam lines, supply steam to the TDEFW pump turbine. The steam supply travels through an additional air operated valve located in the combined inlet to the EFW pump turbine. These valves are normally closed but fail open on loss of instrument air. The valves are actuated by any one of the following actuation signals: low-low steam generator level, safety injection signal, loss of off-site power, or ATWS Mitigation System (AMS) actuation signal. In the event the TDEFW pump fails to start, procedures direct the operators to manually reset and start the pump (which does not require electrical power for motive force or control). The TDEFW pump is sized to provide more than the design basis AFW flow requirement and is located in a Seismic Category I structure designed for protection from applicable design basis external events. No ventilation fans are required for safety related design functions or post-ELAP conditions. TDEFW pump bearings do not rely on external cooling systems.

- Steam Generator Atmospheric Steam Dump Valves (ASDVs)

  During an ELAP/LUHS event with the loss of all AC power and control air, reactor core cooling and decay heat can be removed from the SGs for an indefinite time period by manually operating the ASDVs. Backup nitrogen bottles also allow for operation of each valve from the Control Room after loss of control air, and the practical duration of operation with nitrogen can be extended by operating the valves in jog or "Position Maintained" mode. The ASDVs are safety-related, missile protected, seismically qualified valves. The post-BDBEE temperatures experienced in the areas where the ASDVs are located do not exceed equipment operability limits (Ref. 6.64).

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- Batteries

  The safety related batteries and associated DC distribution systems are located within safety related structures designed to meet applicable design basis external hazards. The batteries power required essential instrumentation and applicable DC control components. Load shedding of non-essential equipment prior to 2 hours after the start of the ELAP event ensures Train A DC loads provide an estimated total service time greater than 12 hours [Ref. 6.22]. Load shedding of non-essential equipment prior to 2 hours after the start of the ELAP event and transferring Bus 11B loads to Bus 11D when Battery 1B reaches 105 VDC terminal voltage, ensures Train B DC loads provide an estimated total service time greater than 12 hours [Ref. 6.22].

- CST

  The CST provides a water source at the initial onset of the event for the core cooling and heat removal strategy. The tank is safety related and is surrounded by a Seismic Category I concrete enclosure designed to withstand applicable design basis external events, protecting the minimum Technical Specification water volume of 212,000 gallons (for a usable volume of 194,000 gallons, [see Section 9.2 of Ref. 6.30]. This volume is adequate for a minimum of 15 hours of SG cooling. [Ref. 6.23].

- Primary FLEX LP Pump (FLPP) Discharge Connection

  The primary FLPP discharge connection for SG injection is on the EFW discharge line located within a Seismic Category I structure (Figure1). A hose will be routed from the FLEX LP Pump discharge to this connection in the EFW Pump room. This connection provides flow to all four Steam Generators. Hydraulic analysis of the flow path from the various potential water sources to this connection has confirmed that applicable performance requirements are met [Ref. 6.25].

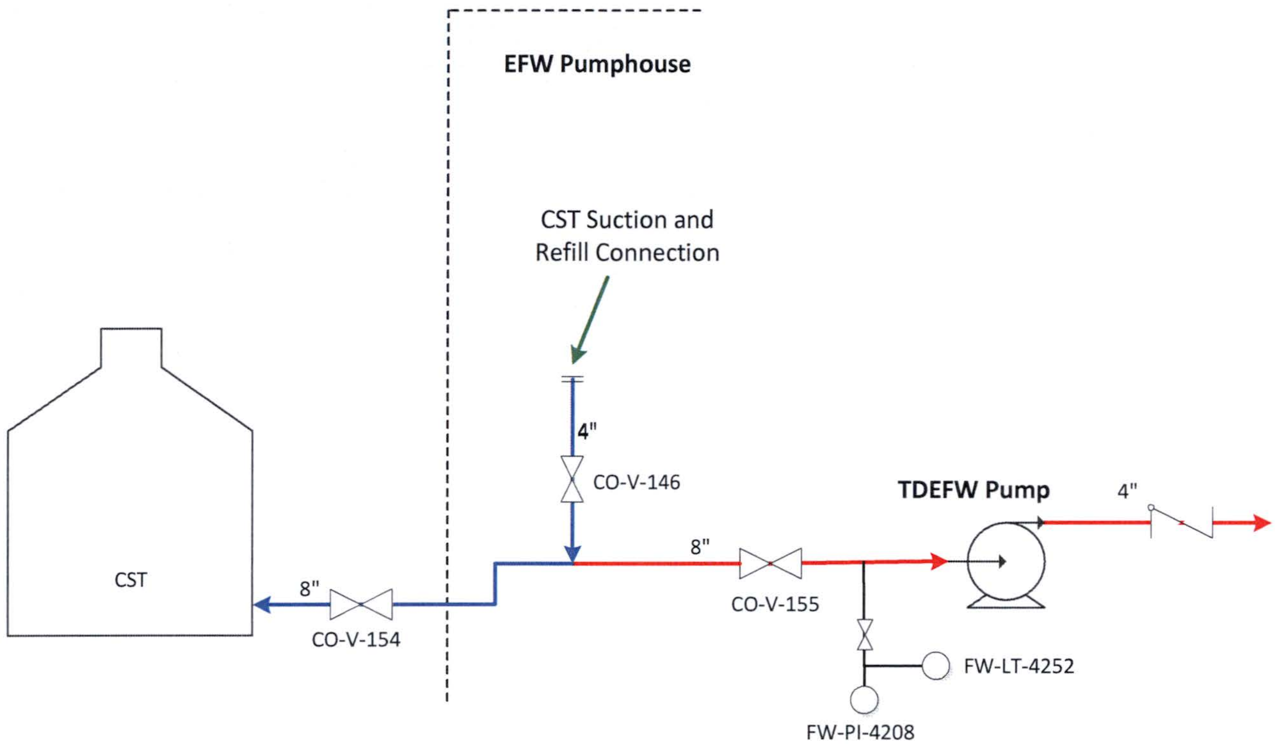
- Alternate FLPP Discharge Connections

  In the event that the primary FLPP discharge connection is not available, an alternate connection scheme is provided. The alternate FLPP discharge connection scheme will connect to one or more of the four main feed headers. These connections are located in the two steam and feed pipe chases. These connections allow flow to be provided to any or all of the four Steam Generators. Flexible hoses will be routed from the FLPP discharge these connections. Hydraulic analysis of the flow path from the various potential water sources to this connection has confirmed that applicable performance requirements are met [Ref. 6.25].

- CST Connections

  The CST suction and refill connection (Figure 3) facilitates refill of the CST or can alternately provide a suction source to the FLPP from the CST. The connection is seismically designed and located a Seismic Category I structure designed for protection from applicable design basis external events. Adapters are used to transition from this threaded connection to the specific hoses used to implement the desired strategy.

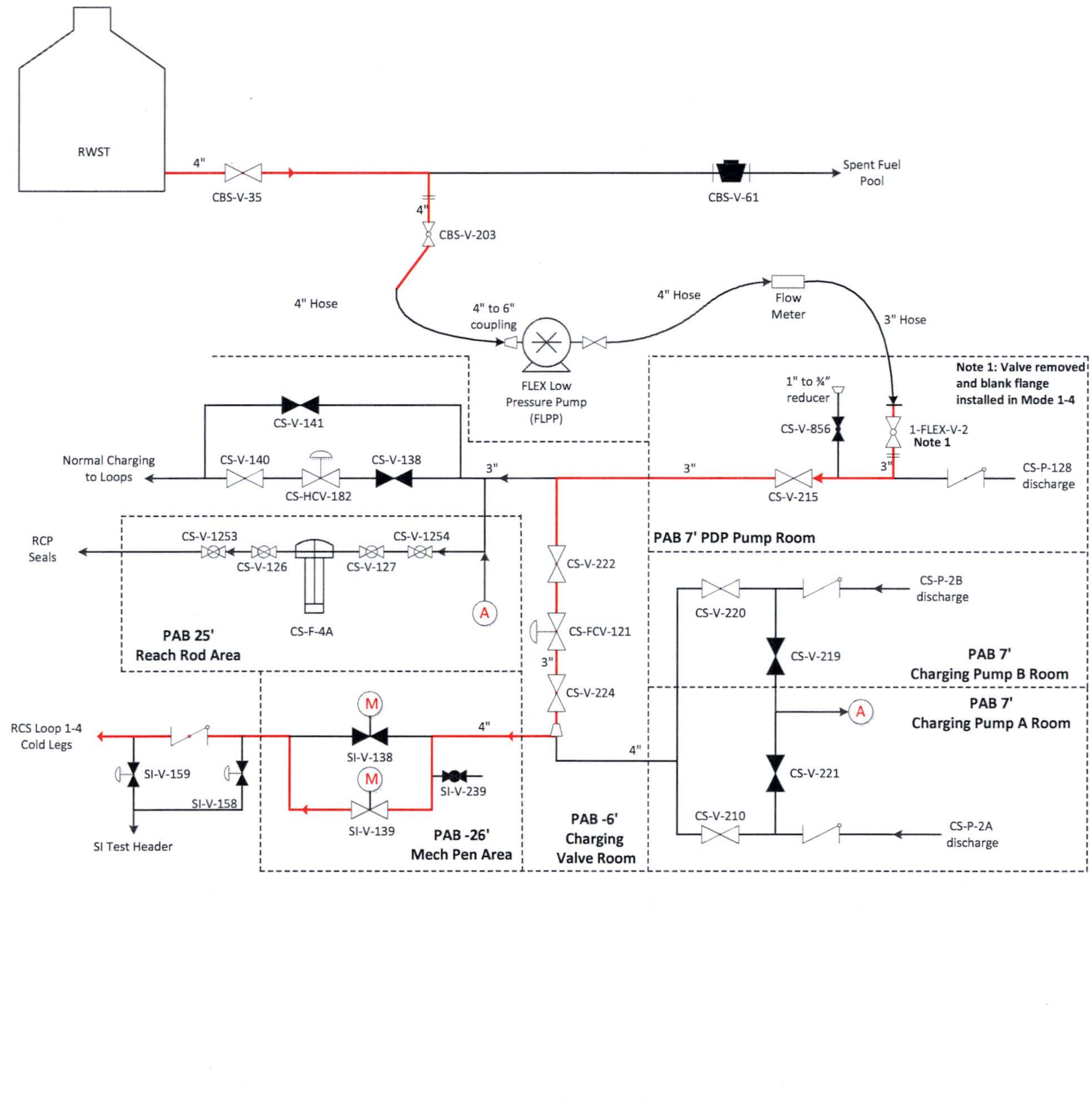
Figure 3: CST Suction and Refill Connection



- Low Pressure RCS Makeup Connection

  The connection for the discharge of the FLPP into the RCS is located downstream of the Positive Displacement Charging Pump (Figure 4). This is used in Modes 5 and 6 without SGs available. The primary supply to the FLPP for RCS makeup is via a connection on the RWST to SFP makeup line.

Figure 4: Low Pressure RCS Makeup Connection



- FLEX HP Pump (FHPP) Discharge Connections

  The primary connection for the discharge of the FHPP into the RCS is located on the positive displacement (PDP) charging pump discharge piping (Figure 5). The flowpath to the RCS is to the RCS is through this header to the four RCS loop cold legs.

  The alternate discharge connection is on the Safety Injection discharge header (Figure 6). The flowpath to the RCS is through this header to the four RCS loop cold legs.

  Both the primary and alternate discharge flowpaths are fully protected from all external hazards applicable to Seabrook (seismic, flood, high winds and associated wind-driven missiles and extreme temperatures). All components are located indoors inside the seismic Category I Primary Auxiliary Building and reactor containment building.

Figure 5: High Pressure RCS Makeup Primary Connection

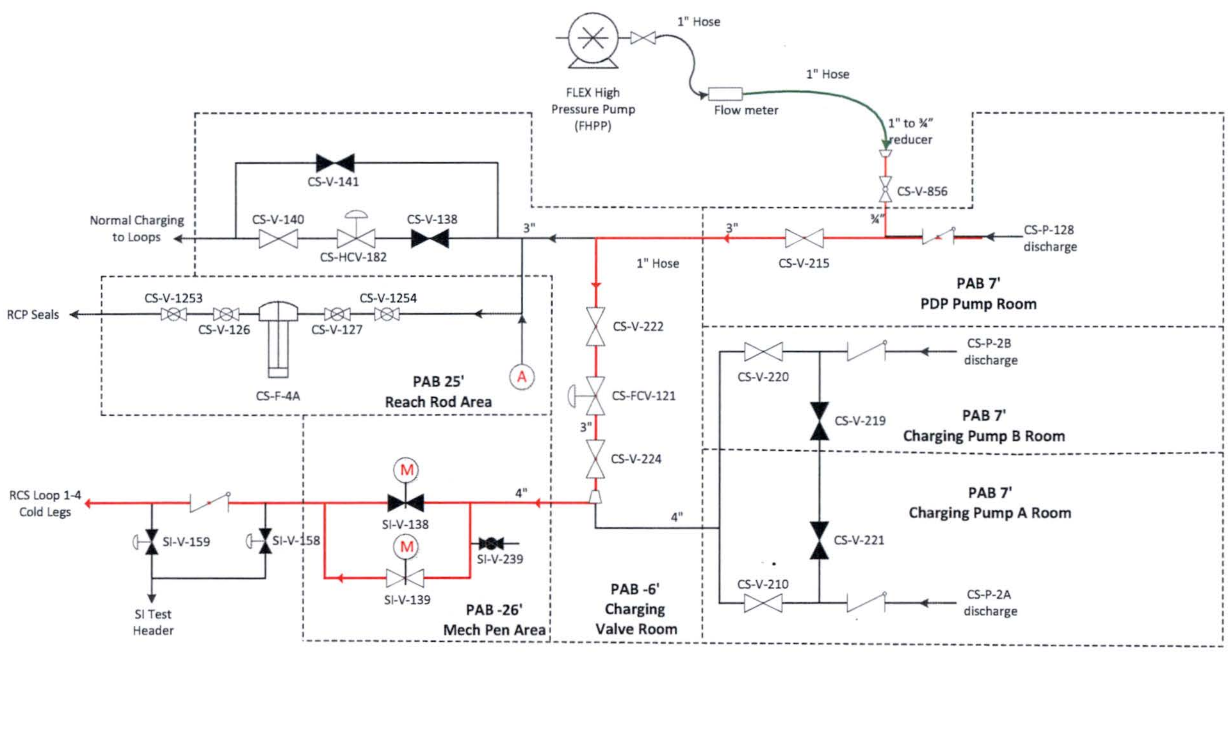
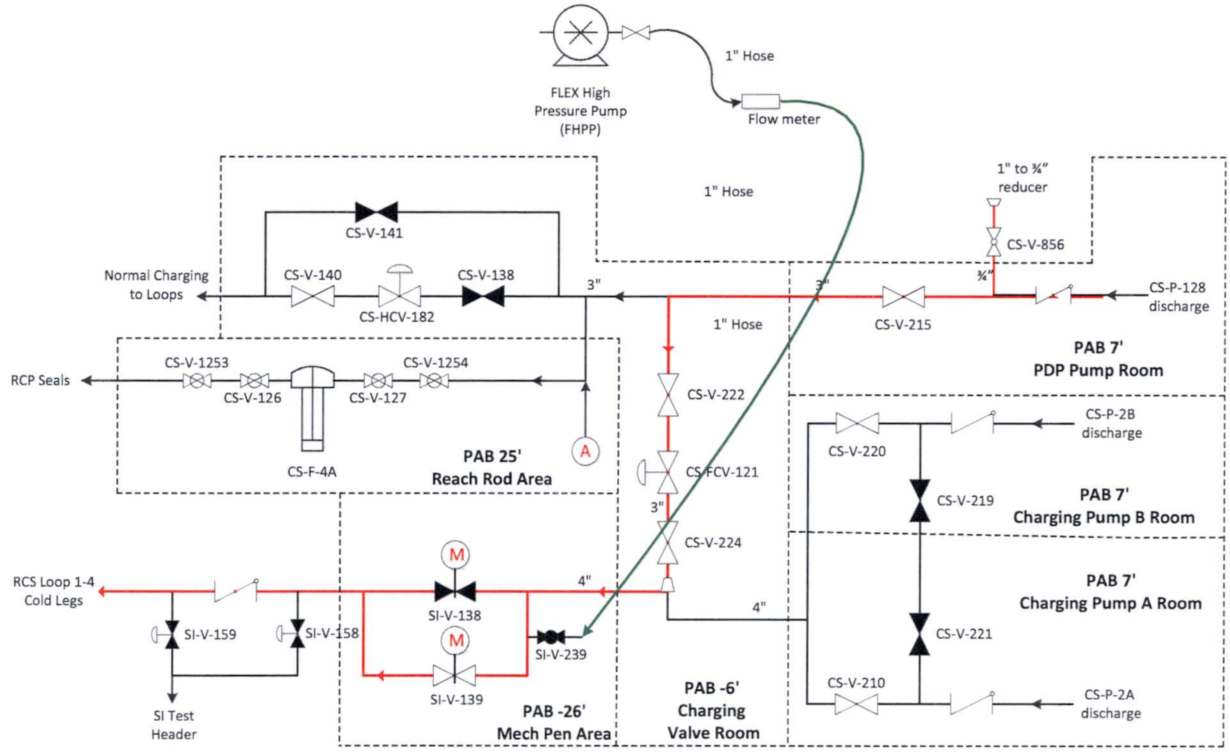


Figure 6: High Pressure RCS Makeup Alternate Connection



- FLEX HP Pump Suction Connections

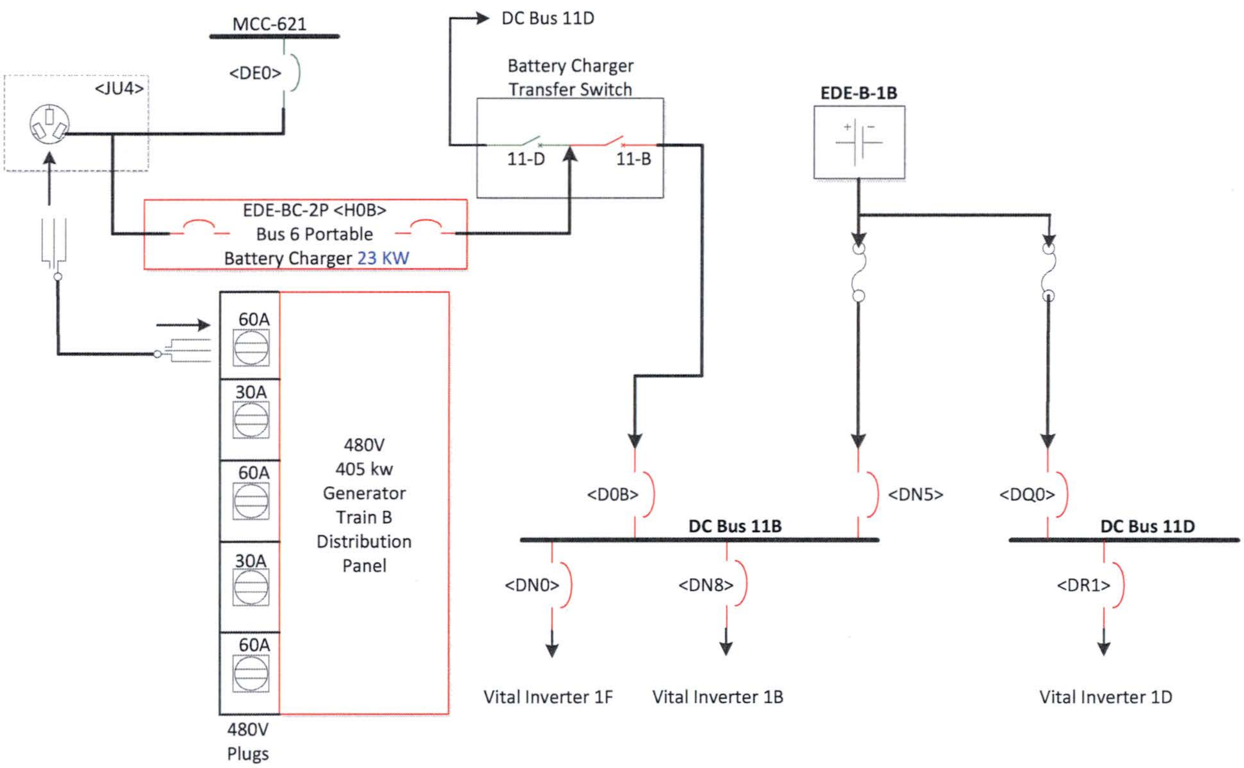
  The primary connections for the suction of the FHPP are at the safety-related BATs (see FSG-8.1, Ref. 6.43). This suction flowpath and connections are fully protected from all external hazards applicable to Seabrook (seismic, flood, high winds and associated wind-driven missiles and extreme temperatures). All components are located indoors the seismic Category I Primary Auxiliary Building.

  The backup suction source is the safety-related RWST, with the connection on the RWST to SFP makeup line (see FSG-8.1, Ref. 6.43). This suction flowpath and connections are fully protected from all external hazards applicable to Seabrook with the exception that the RWST is not fully protected from wind-driven missiles. All components are located indoors the seismic Category I Primary Auxiliary Building, except the SFP makeup valve, CBS-V-35, which is located in the RWST Category I tank room.

- Electrical Connections
  - 480 V Connections

The primary/alternate connections for the FLEX 480V generator are the existing Train A and B portable battery charger connections. Figure 7 shows Train B, the primary connection location; Train A is similar. The primary/alternate connections for the NSRC 480V generator are at Unit Sub 53 and Unit Sub 63.

Figure 7: FLEX 480V Generator Primary Connection to Portable Battery Charger



- 4160V Connections

The SEPS gensets provide the 4160V power for Phase 2 to one of the emergency buses. In the case of SEPS not available, 4160V power is not restored until Phase 3 when the NSRC 4.16 kV generators are connected to either Bus 5 or Bus 6.

3.2.4.1.2. Plant Instrumentation

Instrumentation providing the following key parameters is credited for all phases of the reactor core cooling and decay heat removal strategy. With SEPS available, one train of safety-related vital instrumentation will be powered from SEPS.

- Core Exit Thermocouples*
- Pressurizer Level*
- Reactor Vessel Level Indication System*
- Steam Generator Pressure
- Reactor Coolant System Wide Range Hot Leg Temperature (Train A only)
- Reactor Coolant System Wide Range Cold Leg Temperature (Train B only)
- Reactor Coolant System Wide Range Pressure
- Steam Generator Wide Range Level (Train A: SGs A & C; Train B: SGs B & D)
- Steam Generator Narrow Range Level
- Condensate Storage Tank Level*
- Containment Wide Range Pressure
- SFP Level (including new wide range level per NRC Order EA-12-051)
- Emergency Feedwater Flow* (Train A: SGs A & C; Train B: SGs B & D)

Parameters marked with an * are additional Seabrook Station specific items that are not listed in NEI 12-06 Section 3.2.1.10.

The above essential instrumentation will be available prior to and after load stripping of the DC and AC buses during Phase 1. All indications will be in the Control Room (CR).

If SEPS is unavailable, the portable FLEX 480 V generator will be used to repower a battery charger for the vital DC Bus inverters providing power to a train of safety related vital instrumentation. The portable generator has primary and alternate connections, using installed 480 V receptacles on Train A or train B for powering safety related DC bus portable battery chargers.

In the unlikely event that neither SEPS nor the FLEX 480 V generator are able to restore vital instrumentation an additional backup option, or should any of the signal cabling to the control room indicators be damaged or DC power lost, the FSGs directs actions to obtain vital instrument readings from the control room cabinets or locally at the containment penetrations. Procedure FSG-7.1.1 [Ref. 6.31] provides location and termination information in the control room for all essential instrumentation. For those containment transmitters where signal integrity is lost between the penetration and the CR, FSG-7.1.1 provides location and termination information at accessible field locations nearer to the signal sources. For other instruments not in the containment, measurements can be taken locally at the transmitter. Where applicable, scaling sheets are provided to convert the transmitter output to the process variable. The hand held devices have built in power supplies which can be used to provide loop power.

The portable FLEX equipment is supplied with the local instrumentation needed to operate the equipment. The use of these instruments is detailed in the associated FSGs for use of the equipment or local operating placards. These procedures are based on inputs from the equipment suppliers, operating experience, and expected equipment function in an ELAP.

3.2.4.2. Thermal-Hydraulic Analyses

3.2.4.2.1. Secondary Analysis

Thermal Hydraulic calculations were performed to determine the inventory required to maintain steam generator levels and times associated with the volumes. The conclusions from this analysis showed that the existing CST usable volume of approximately 194,000 gallons would be depleted in approximately 15 hours at which time another source of water is required [Ref. 6.23]. If the SEPS/SWCT is available, the plant can be transitioned to shutdown cooling in that time period prior to requiring an alternate water source.

There are several alternate water sources available on site as listed in Table **3** The below grade Unit 2 Circulating Water Piping Cistern is protected from all hazards and is constructed using below ground piping from the abandoned Unit 2 Circulating Water system. This provides a clean water source sufficient for at least 72 hours into the ELAPLUHS event.

3.2.4.2.2. Reactor Coolant System Analysis

Seabrook performed a site-specific analysis to determine the RCS makeup flow rates that satisfy the RCS inventory control and boration requirements [Ref. 6.33]. This analysis credits SI accumulator injection for RCS makeup and boration, and also credits the installed low leakage RCP seals for limiting inventory loss. The limiting makeup time for RCS inventory makeup to commence after ELAP initiation is:

- for the case with SEPS in service, 59.8 hours
- for the case without SEPS available, 61.3 hours.

When SEPS is available, boration can be performed using installed plant systems and equipment. The Seabrook Station strategy is to commence cooldown and boration no later than 2 hours post-ELAP in the SEPS available case. The site-specific analysis shows this will maintain the reactor subcritical for at least 72 hours post-ELAP.

The site-specific analysis also determined that with SEPS not available, cooldown to 350°F may be initiated any time between 2 and 10 hours post-ELAP, and that boration from the BAT or RWST may be delayed up to 20 hours post-ELAP. The Seabrook Station strategy is to commence cooldown and boration no later than 10 hours post-ELAP in the SEPS not available case.

3.2.4.3. Reactor Coolant Pump Seals

Seabrook Station is a Westinghouse plant with Westinghouse SHIELD Passive Thermal Shutdown Seals [Ref. 6.34]. As demonstrated by testing documented in TR-FSE-14-1-P [Ref. 6.35], the RCP seal leakage associated with the loss of seal component cooling water is under 1 gpm per seal. As described in reference 6.34, the conditions of the NRC Letter of Endorsement of Westinghouse SHIELD Passive Shutdown Seal For FLEX Strategies [Ref. 6.70], are met by this design. For the Seabrook Station ELAP scenario, the RCP seal leakage rates are conservatively assumed to be at 1 gpm per pump.

3.2.4.4. Shutdown Margin Analyses

A Shutdown Margin Analysis determined a reactivity Shutdown Margin of at least 1% (Keff<0.99) is available through the initial cooldown period to 350 psig SG pressure [Ref. 6.33]. However, to maintain Shutdown Margin into and through the extended cooldown phase, additional core boron is needed in order to continue to RCS cooldown. Calculations show that injection of 3150 gallons of borated water from the Boric Acid Tank (BAT) or 10,800 gallons of borated water from the RWST will be adequate to meet shutdown reactivity requirements at an RCS temperature of 350°F. These makeup volumes are less than the temperature induced RCS shrink and the available pressurizer volume, so actions to provide RCS letdown paths are not expected to be needed. The boron addition with SEPS available uses available flow paths and can rapidly provide borated water to the RCS. With SEPS unavailable, the boration addition will be performed using the FHPP, which at 15 gpm can provide the volumes listed in 3.5 hours for the BAT and 12 hours for the RWST. Further boration will be required to transition from 350°F to cold shutdown.

The Shutdown Margin analysis assumes a uniform boron mixing model. Boron mixing was identified as a generic concern by the NRC and was then addressed by the PWR Owner's Group (PWROG). The NRC endorsed the PWROG boron mixing position paper with the clarification that a one hour mixing time was adequate provided that the flow in all loops is greater than or equal to the corresponding single-phase natural circulation cooling flow rate [Ref. 6.71]. The mixing time is included in the Shutdown Margin analysis.

3.2.4.5. FLEX Pumps and Water Supplies

3.2.4.5.1. FLPP

Consistent with NEI 12-06, Appendix D, the emergency feedwater injection capability is provided using a portable FLPP through a primary or alternate connection. The FLPP is rated for 325 gpm @400 psig [Ref. 6.36]. The FLPP is a trailer-mounted, diesel engine driven centrifugal pump that is stored in the SWPH. The FLPP will provide a SG injection method in the event that the TDEFW pump can no longer perform its function. Hydraulic analyses has confirmed that the FLPP is sized to provide the required SG injection flow rate to support reactor core cooling and decay heat removal [Ref. 6.25]. The FLPP may also be used in Modes 5/6 without SGs available, to provide makeup to the RCS.

3.2.4.5.2. Unit 2 Circulating Water Piping Cistern Submersible Pump

When the Unit 2 Circulating Water Piping Cistern is the water source feeding the FLPP, a booster pump is needed to meet the FLPP Net Positive Suction Head (NPSH) requirements. The Submersible Pump is mounted on a trailer mounted 30 kW generator and is deployed to the Unit 2 Circulating Water Piping Cistern access point. The 30 kW generator provides the power to run the Submersible Pump. The Submersible Pump can provide 325 gpm at approximately 45 psig TDH (Ref. 6.83). The Submersible Pump can also be used in FLEX strategies for CST makeup.

3.2.4.5.3. FLPP Water Sources

- CST

The CST provides sufficient inventory to meet Phase 1 requirements. The qualified inventory of 194,000 gallons [see Section 9.2 of Ref. 6.30] is adequate to provide makeup flow to the SGs for approximately 15 hours [Ref. 6.23]. The qualified inventory excludes unusable volumes below the minimum suction nozzle submergence level, and also excludes the unprotected volume in the upper portion of the tank. In the primary strategy with SEPS and the SWCT available, the operators will transition to RHR prior to exhausting the CST volume. In the backup strategy with SEPS or the SWCT unavailable, the

Submersible Pump or the SWCT Makeup Pump can take suction from several additional water sources to refill the CST.

- Additional FLPP Water Sources

The various sources on site that may be accessed to supply the FLEX LP Pump are shown in Table 3 with their respective capacity and water quality. Each source has connections available that can be either directly used or used with provided adapters to connect to suction hose and feed the FLPP. Note that the U2 Circulating Water Piping Cistern uses a submersible pump to provide water to the FLPP suction, and when pumping directly from the FP tanks, the SWCT Makeup Pump is used to move water from the FP tanks' location to the FLPP suction. The order in which the sources are tapped is based on actual availability in the event, water quality, and strategy complexity. Available sources that supply demineralized water to inject into the SGs are designated to be accessed first if available.

3.2.4.5.4. FLEX HP Pump

Consistent with NEI 12-06, Appendix D, the borated RCS makeup capability is provided using a portable FHPP through a primary or alternate connection. The FHPP is capable of at least 15 gpm @ at least 1500 psig [Ref 6.37]. The FHPP is a trailer-mounted, diesel engine driven positive displacement pump that is stored in the SWPH. The FHPP will provide an RCS boron injection method to support plant cooldown, and if required can provide injection to maintain RCS inventory. Hydraulic analysis has confirmed that the FHPP is sized to provide the required RCS injection flow rate to support reactor cooldown [Ref. 6.25].

3.2.4.5.5. Borated Water Sources

Two sources of borated water have been evaluated for use during a BDBEE. Each source has connections available that can be either directly used or used with provided adapters to connect to suction hose and feed the FHPP, and the RWST has a connection available for use with the FLPP for the Modes 5 and 6 strategy. Each borated water source is discussed below, in order of preference.

- **Boric Acid Tanks (BATs)**: Two seismically qualified, missile protected boric acid tanks are available to provide a suction source for the repowered charging pump (SEPS available) or FLEX HP pump to inject borated water into the RCS. These tanks are maintained greater than 14,600 gallons each at a minimum boron concentration of 7,000 ppm. These tanks are the primary source for RCS makeup and Reactor shutdown margin maintenance.

- **RWST:** The tank is a safety-related, seismically qualified storage tank, located within a seismic building, but is not qualified for missile protection. During power operation the RWST volume and boron concentration are maintained per the requirements of the Core Operating Limits Report (the current requirements are greater than 477,000 gallons at a minimum boron concentration of 2400 ppm). Of this volume, approximately 415,000 gallons are available for use while respecting NPSH requirements for the FHPP. The RWST is the borated water source for the RCS Injection strategy where the FLPP is deployed following a BDBEE during Modes 5 and 6 without SGs available. The RWST is also an alternate source for RCS makeup and Reactor shutdown margin maintenance following a BDBEE during all Modes.

3.2.4.6. Electrical Analyses

The strategy for early load shedding of 120VDC loads results in a Class 1E total battery duty cycle of at least 12 hours, calculated in accordance with the IEEE-485 methodology [Ref. 6.22]. This duration is beyond the expected deployment time of 8 hours for FLEX equipment to supply the DC loads and repower the battery chargers per Table 2. The strategy to re-power the station's vital AC and DC buses requires the use of a 480V diesel powered generator. The FLEX 480 VAC diesel generator has a 405 KW standby rating and is trailer-mounted with a double-walled diesel fuel tank built into the trailer. The tank is sized to provide fuel for 12 hours of full load operation. The power rating was evaluated to be adequate to support electrical loads associated with Phase 2 strategies [see Attachment 7.3 to Ref. 6.29].

Additional replacement 480 VAC and 4.16kV generators are available from the NSRC for the Phase 3 strategies.

3.3. Spent Fuel Cooling Strategies

The basic FLEX strategy for maintaining the SFP cooling function with SEPS is to restart SFP cooling once the Emergency Bus has been reenergized. In the primary strategy with the SEPS/SWCT available, one train of SFP cooling will be available. The backup strategy (without SEPS) is to monitor SFP level and provide makeup water to the SFP sufficient to maintain the normal SFP level.

3.3.1. Phase 1 Strategy

Reestablish SFP cooling if SEPS is available. Additionally, If SEPS is not available, monitor nozzles are deployed at the SFP and hoses run from the monitor nozzles to outside the Fuel Storage Building (FSB) prior to excessive FSB heatup as a contingency for SFP makeup. To expedite deployment, the monitor nozzles and hoses are located in the PAB. With SEPS not available, SFP level is monitored using instrumentation installed as required by NRC Order EA-12-051 and SFP makeup provided as needed.

3.3.2. Phase 2 Strategy

If SEPS and consequently SFP cooling is not available, then the preferred Phase 2 strategy initiates makeup using the hard piped connection from the RWST to gravity drain to the SFP. If this makeup source is not available, there are multiple strategies to pump water in a prioritized fashion from alternate sources to maintain SFP level using the prestaged monitor nozzles and hoses. These strategies include:

Makeup from the Fire Protection System from a fire hydrant

Makeup from the Unit 2 Circulating Water Pipe Cistern using the FLEX Submersible Pump

Makeup from a Demin Water Storage Tank using the Cooling Tower Makeup Pump

Makeup from the discharge of the Fire Protection Pumps using the FLPP

Makeup from the Fire Protection Tanks using the Cooling Tower Makeup Pump and the FLPP

Makeup using the FLPP in parallel with feeding the SGs

3.3.3. Phase 3 Strategy

Phase 3 strategies are to continue Spent Fuel Cooling system operation indefinitely (with SEPS available) or maintain the SFP Cooling and Makeup strategy indefinitely (SEPS not available).

3.3.4. SFP Cooling Strategies Evaluation

3.3.4.1. Plant Structures, Systems and Components

3.3.4.1.1. SFP Strategy Connections

- Primary Makeup

Makeup to the SFP can be accomplished by gravity drain from the RWST using existing piping located within Seismic Category I structures. Opening one valve in the FSB early in the event allows ongoing control of makeup to the SFP without entry into the FSB. This is an existing, proceduralized process that requires no FLEX equipment or AC or DC power to accomplish.

- Alternate Makeup

The alternate strategy for providing makeup water to the SFP is to provide flow through hoses and monitor nozzles pre-staged early in the event. The monitor nozzles will be clamped to the spent fuel handling machine rails to fix their position so that water can be discharged directly into the pool. The hoses will be run from the monitor nozzles to outside the Fuel Storage Building. There are numerous possible methods for supplying flow to these hoses including from the fire protection system, the Unit 2 Circulating Water Piping Cistern using the Submersible Pump, or discharge of the FLPP. The hoses and monitor nozzles that are pre-staged early in the event are located in the PAB. The remaining equipment used to support implementation of this strategy is stored in the SWPH. Except for the pre-staged monitor nozzles and hoses, the equipment needed to implement these strategies is deployed from the SWPH.

- SFP Ventilation

Ventilation requirements to prevent excessive steam accumulation in the Fuel Storage Building are satisfied by opening the overhead door at the ground elevation of the FSB and filter enclosure door on the FSB upper levels to establish natural circulation out through the plant vent system. Airflow through these doors provides adequate vent pathways through which the steam generated by SFP boiling can exit the FSB.

3.3.4.1.2. Plant Instrumentation

The key parameter for the SFP Make-up strategy is the SFP water level. The SFP water level is monitored remotely by the redundant instrumentation installed in compliance with Order EA-12-051, Reliable SFP Level Instrumentation.

3.3.4.2. Thermal-Hydraulic Analyses

Analysis was performed that determined the SFP temperature rise associated with the maximum expected SFP heat load immediately following a core offload [Ref. 6.38]. The analysis determined that with no operator action following a loss of SFP cooling at the maximum design heat load (plant shutdown, full core offload), the SFP will reach a bulk temperature of 212ºF in approximately 3 hours and boil off to a level at the top of fuel racks in approximately 30 hours. A flow of 100 gpm will replenish the water being boiled off. The heat up time corresponding with the plant operating 100 days following refueling is approximately 14 hours to 212°F. Establishing normal SFP Cooling (with SEPS available) within

12 hours, or commencing SFP makeup with at least 100 gpm flow (SEPS not available) will ensure adequate cooling for the fuel in the SFP. Hydraulic analysis of the flow path from each water source to the SFP has confirmed that applicable performance requirements are met [Ref. 6.25 and Attachment 1 to Ref. 6.39].

3.3.4.3. FLEX Pumps and Water Sources

3.3.4.3.1. SFP Makeup Pumps

The pumps used to supply water to the SFP are the same as those used to supply the SG low pressure feed strategies – the Unit 2 Circulating Water Piping Cistern Submersible Pump, the FLPP, Cooling Tower Makeup Pump and ,if available, the Fire Pumps (via a nearby hydrant). When the FLPP is in service providing SG feed, it can simultaneously be used to feed the SFP. Details of the FLPP are discussed above. The Unit 2 Circulating Water Piping Cistern Submersible Pump is capable of providing 100 gpm at 74 psig TDH, which is adequate to make up to the SFP per the hydraulic analysis [Attachment 1 to Ref. 6.39].

3.3.4.3.2. SFP Makeup Water Supplies

The preferred source for SFP is the RWST. Alternate sources include the DWSTs, water from the Fire Protection System, and the Unit 2 Circulating Water Piping Cistern, which is protected against all hazards.

3.3.4.4. Electrical Analyses

The SFP will be monitored by instrumentation installed by Order EA-12-051. The power for this equipment has backup battery capacity for 72 hours. The normal power for these instruments is provided by vital buses, one train of which will be repowered by SEPS or the 405 kW generator (and in Phase 3, using the NSRC generators). As an alternate, each channel can be powered from an extension cord and a 120V AC outlet.

3.4. Containment Function Strategies

With an Extended Loss of All AC power (ELAP) initiated in Modes 1-4, containment cooling will be available from the repowered Emergency bus with SEPS available. In the event that SEPS is not available, containment cooling will be lost for an extended period of time. Containment temperature and pressure will slowly increase. Structural integrity of the reactor containment building, due to increasing containment pressure, will not be challenged during the first few weeks of a BDBEE ELAP event (at 5 days into the event, containment pressure is 11.2 psig) [Ref 6.40]. Containment temperature at 5 days into the event is 200°F, and at this point is increasing slowly. Therefore, Phase 2 actions to reduce containment temperature (below 200°F) and pressure (below 11.2 psig) to ensure continued containment integrity will not be required. Eventual containment cooling and depressurization to normal values may utilize off-site equipment and resources during Phase 3 (within 72 hours). For scenarios with steam generators or RHR removing core heat, no specific coping strategy is required for maintaining containment integrity during Phase 1, 2 or 3. In modes 5 & 6 without steam generators, containment venting will be established as required for RCS once-through cooling by using a temporary manifold installed in the Combustible Gas Control (CGC) piping inside containment. This temporary manifold includes a 6" check valve that will allow flow from the containment atmosphere into the CGC piping if an exit path from the CGC piping is provided. If an ELAP event should occur in modes 5 or 6, this exit path is provided by opening a flanged connection outside containment. Calculation C-X-1-28141, Containment Response During ELAP - GOTHIC [Ref. 6.40] verifies that use of this vent path prevents challenge of the containment design pressure or temperature for at least 120 hours into the event. Consequently there will be no challenge to containment structural integrity in these modes.

3.4.1. Phase 1 Strategy

The Phase 1 coping strategy for containment involves verifying containment isolation per "Station Blackout," and monitoring containment pressure using installed instrumentation. Containment pressure will be available via essential plant instrumentation.

3.4.2. Phase 2 Strategy

Phase 2 coping strategy is to continue monitoring containment pressure using installed instrumentation. Phase 2 activities to repower instruments are adequate to facilitate continued containment monitoring.

3.4.3. Phase 3 Strategy

FLEX coping strategies will ensure no challenge to the containment function for at least the first 120 hours [Ref. 6.40]. In Phase 3 the necessary actions to reduce containment temperature and pressure and to ensure continued functionality of the key parameters will utilize existing plant systems restored by off-site equipment and resources. The most significant need is to provide power to station pumps and to restore the UHS with portable NSRC pumps (with SEPS not available). If SEPS/SWCT are available, limited containment cooling would be available in Phases 2 and 3.

The Phase 3 coping strategy discussed in Section 3.2.3 is to obtain additional electrical capability and redundancy for on-site equipment until such time that normal power to the site can be restored. This capability will be provided by portable generators provided by the NSRC. Two mobile 4.16 kV generators and one 480V generator will be brought in from the NSRC in order to supply power to either of the emergency buses. The 4160V generators are connected via the SEPS breaker and the 480V generator is connected via a Unit Sub spare cubicle. By restoring the Class 1E 4kV bus and 480V unit substations, power can be restored to the 4160/480 VAC transformers to power selected safe shutdown loads. No additional specific phase 3 strategy is required for maintaining containment integrity.

3.4.4. Containment Strategies Evaluation

3.4.4.1. Plant Structures, Systems and Components

3.4.4.1.1. Containment Ventilation Strategy Equipment

In Modes 1 through 4 there is no immediate threat to containment integrity. For Mode 6 and mode 5 without steam generators, FSG-14 establishes a containment ventilation strategy that utilizes CGC piping to ventilate containment. Prior to draining the SGs in Mode 5, an air supply manifold is installed in the CGC piping inside containment. The air manifold includes a check valve that will allow flow from the containment atmosphere into the CGC piping. If a containment vent path is needed, removal of a piping flange and opening a valve outside containment will provide the vent path.

3.4.4.1.2. Containment Strategy Instrumentation

Containment pressure indication is available in the Control Room (CR) or locally at the instrument (using Measuring & Test Equipment) throughout the event.

3.4.4.2. Thermal-Hydraulic Analyses

Containment temperature and pressure will remain well below containment design limits for at least five days assuming 1 GPM per RCP seal leakage and a 1 GPM unidentified leak rate, for a total RCS leakage rate of 5 gpm into containment [Ref. 6.40].

3.4.4.3. FLEX Pumps and Water Sources

In the case where SEPS and/or the SWCT are unavailable, the NSRC low pressure high flow (LPHF) pump and suction booster pumps will be used to restore the UHS. The submersible pump heads are placed in the SW forebay and supply the LPHF pump. The LPHF pump will discharge into the A/C SW pump discharge, which can be fed to either SW loop.

3.4.4.4. Electrical Analyses

Several options described above require the powering of the Train A or B Emergency bus, either via SEPS or using equipment supplied by the

NSRC. The 4.16KV and 480V generators are adequate for the Phase 3 loads.

3.5. Characterization of External Hazards

Seabrook Station is located at approximately 43° north latitude, 71° west longitude on the western shore of Hampton Harbor in Rockingham County, in the township of Seabrook, New Hampshire. The site is located about two miles from the open Atlantic Ocean resulting in a definite maritime influence on the general climate. Winter temperature extremes are tempered by the relatively warmer water, and summer temperatures are moderated by a sea breeze. Precipitation amounts are uniform throughout the year, with an occasional heavy rainfall during a northeast storm. The site is not usually subjected to the full strength of east coast hurricanes. Such storms usually move either offshore or inland before they reach the Seabrook latitude.

Seabrook Station 'screens in' for the following external hazards as defined in Sections 4 through 9 of NEI 12-06:

- Seismic events
- External flooding events
- High wind events with the potential for wind-driven missiles from hurricanes and tornados
- Snow, ice, and extreme cold events

3.5.1. Seismic

The licensing basis for Seismic Category I (SC-1) equipment at Seabrook Station is defined in Updated Final Safety Analysis Report (UFSAR), Section 3.7(B) [Ref. 6.30]. Site design Ground Motion Response Spectra (GMRS) for the Safe Shutdown Earthquake (SSE) are provided in UFSAR Figures 3.7(B)-1, 3.7(B)-2, and 3.7(B)-3 and adhere to Regulatory Guide 1.60, 'Design Response Spectra for Seismic Design of Nuclear Power Plants'. Damping values for SC-1 equipment are listed in UFSAR Table 3.7(B)-1 and conform to Regulatory Guide 1.61, 'Damping Values for Seismic Design of Nuclear Power Plants'.

The SSE is based on the postulated occurrence of a magnitude VIII(MM) earthquake located at the site. The horizontal peak acceleration associated with the maximum earthquake potential intensity according to the intensity-acceleration relationship established by Trifunac and Brady (1975) is 0.25g (mean plus one sigma). Assuming that the vertical peak acceleration is two-thirds of the horizontal acceleration (Newmark and Hall, 1977), 0.167g is selected accordingly [Section 2.5 of Ref. 6.30].

A seismic re-evaluation of the site required by the 10 CFR 50.54(f) Request For Information letter of March 12, 2012 [Ref. 6.41] has been completed and based on comparison of the existing station SSE and reevaluated GMRS curves, Seabrook Screens in for a risk evaluation, an SFP Evaluation, and a high Frequency Confirmation [Ref. 6.42].

Seabrook selected a set of plant equipment needed to support implementation of the FLEX strategies. This set of equipment was evaluated using the Expedited Seismic Evaluation Process (ESEP) in accordance with EPRI-3002000704 [Ref. 6.54] to demonstrate seismic margin. A single item was identified where the High Confidence of a Low Probability of Failure level was below the Relative Level Ground Motion level, and this has been addressed [Ref. 6.55].

The SEPS components were not included in the ESEP, as they were originally designed non-safety related and non-seismic. Modifications have been implemented to ensure the SEPS equipment is seismically rugged [Ref. 6.56 and Ref. 6.57].

3.5.2. Flooding

The Current Licensing Basis for Flood Protection for Seabrook Station includes the ability to withstand the effects of a combined Standard Project Storm (SPS) and Probable Maximum Hurricane (PMH). It also considers the effects of wave run-up during the SPS / PMH storm.

Site grade is at elevation 20 feet Mean Sea Level (MSL) and the anticipated elevation of flood water (ponding) during the SPS/PMH storm is 20.7 feet MSL. Wave run-up that can accompany the combined SPS / PMH is estimated to achieve an elevation of 21.8 feet MSL on the east and south walls of specific site buildings for a short duration of approximately 1-2 hours. All safety related systems and components are protected against floods [see Section 3.4 of Ref 6.30]. These systems and components are protected by the structures which house them, and/or by being located above a maximum water level not exceeding 21 feet MSL, postulated to result during the combined PMH-SPS event.

A flooding re-evaluation of the site required by the 10 CFR 50.54(f) Request For Information letter of March 12, 2012 [Ref. 6.41] was performed and submitted to the NRC [Ref. 6.44]. The re-evaluation included an updated storm surge assessment, a local intense precipitation (LIP) assessment, and the effects of tsunami, seiche, riverine flooding, ice-induced flooding, dam breaches, and channel migration. The results of these assessments indicate with the exception of Storm Surge and LIP flooding, flood levels remain well below the power block elevation (+20 ft. Seabrook Datum) and the general flood protection level (+21 ft. Seabrook Datum). Flooding due to worst case storm surge and worst case LIP scenarios exceeded the current licensing basis and could result in some internal flooding. FLEX strategies deploy the FLEX equipment after floodwaters have receded. Once the revised flood hazard is accepted by the NRC, Seabrook plans to comply with 50.54(f) and NEI 12-06 attachment G (Ref. 6.85).

Plant procedures require that for a Category 3, 4, or 5 Hurricane, the unit shall be shutdown to Mode 5 at least two (2) hours before the projected onset of sustained category 3, 4, or 5 hurricane force winds within the Owner Controlled Area [Ref. 6.45 and Ref. 6.58]. On-site resources and staffing are significantly increased in advance of the projected storm. Guidance is also given for operators to ensure major fuel oil tanks are full and that the CST has significant inventory. Therefore, prior to the arrival of hurricane induced flooding and high winds, the plant is in a unique state and well prepared to cope with the event.

3.5.3. High Wind Event

Seabrook is a coastal site and is subject to high wind hazards. Seabrook Station is situated near the 160 mph hurricane contour shown in Figure 7-1 of NEI 12-06. NEI 12-06 Figure 7-2 shows Seabrook to be in Region 2 with a recommended tornado wind speed of 170 mph.

High winds and tornado loadings are discussed in Seabrook Station UFSAR Chapter 3, Section 3.3, 'Wind and Tornado Loadings' [Ref. 6.30]. Per UFSAR Section 3.3.1.1, the design wind velocity is 110 mph at 30 feet above ground. The design of seismic Class 1 structures considers wind loading based on this design wind speed. UFSAR Section 3.3.2 states that the design tornado has a maximum wind velocity of 360 mph (maximum tangential velocity of 290 mph plus a maximum translational velocity of 70 mph). The design tornado applied to Seabrook is conservative as NUREG/CR-4461 Rev. 2, Table 6-1, on which NEI 12-06 Figure 7-2 is based, lists Seabrook possible tornado wind speeds from 143 mph to 254 mph depending on the probability level used [Ref. 6.46]. Additionally, tornados in coastal New England are rare and generally of lower severity than assumed in the UFSAR.

The portable FLEX equipment is located in a Seismic Category I structure that is protected from the full spectrum of UFSAR missiles.

The SEPS and SWCT are not fully protected from all UFSAR wind driven missiles. The SEPS environmental enclosures are non-safety related structures but are designed for a sustained wind loading of 120 mph which exceeds the UFSAR value of 110 mph. The SWCT is a seismic Category I structure that is not fully evaluated for missile impact. It also has building openings that make it potentially vulnerable to vertical and oblique trajectory missiles.

The Unit 2 Circulating Water Cistern is below grade and has a missile shield at the point of access. The shield provides protection from the full spectrum of UFSAR missiles based on a wind speed of 200 mph. This wind speed value is lower than the UFSAR design value for tornado wind speed but is consistent with the current guidance found in the applicable Regulatory

Guides for maximum tornado and hurricane winds. Specifically, a tornado wind speed of 200 mph is shown in R.G. 1.76, Revision 1, Figure 1 for Region II (where Seabrook is located) [Ref. 6.47]. The peak hurricane wind gust for the Seabrook location shown on Figure 3 of R.G. 1.221 is 171mph [Ref. 6.48]. The corresponding missile velocities were calculated for the UFSAR missile spectrum.

3.5.4. Snow, Ice and Extreme Cold

Seabrook Station UFSAR Section 2.3.2, 'Local Meteorology', notes that extremes of temperature are uncommon due to the proximity of the site to the Atlantic Ocean. Winter arctic air masses can produce low minimum temperatures, but the frequency and persistence of such extreme values along the coast is less than inland locations. UFSAR Section 2.3.2 also notes that the 100-Year Return Period minimum hourly dry bulb temperature determined at Pease Air Force Base (approximately 15 miles north of Seabrook Station) is -16.8 °F and, since the design of certain equipment is dependent upon the maximum and minimum temperatures averaged over time periods greater than one hour, the 100-year return period extreme low temperature for 24-hour averaging periods was determined to be -16 °F.

UFSAR Section 2.3.1 notes that the Seabrook site is subjected not only to storms that track across the continental United States, but also to intense winter storms, (i.e., "Nor'easters,") that move northeastward along the U.S. east coast. During the winter months Nor'easters can produce heavy rain or snowfall, and occasionally bring ice storm conditions to the area. Nor'easter winds are typically less severe than those of postulated hurricanes. Seabrook structures are designed for snow and ice loads and, based on the analysis in UFSAR Section 2.4.2.3, Effects of LIP, snow and ice accumulation on roofs, or impounded rainwater, will not exceed the design basis for safety-related buildings. From Figure 8.2 of NEI 12-06, Seabrook Station location falls under Level 4 corresponding to severe damage to power lines and/or existence of large amount of ice.

3.5.5. Extreme Heat

Seabrook Station 'screens out' of the extreme high temperature hazard based upon the following information:

- Contrary to the assertion in Section 9 of NEI 12-06 that "virtually all of the 48 contiguous states have experienced temperatures in excess of 110°F", the record high temperature for the State of New Hampshire is 106°F which was recorded in Nashua, NH in 1911*. Nashua is located in the western part of the state away from the coast.
- Seabrook UFSAR Section 2.3.2, 'Local Meteorology', notes that extremes of temperature are uncommon due to the proximity of the site to the Atlantic

Ocean. During the spring and summer a sea breeze usually moderates temperatures from reaching high extremes at the site.

- The highest recorded temperature for Portsmouth, NH which is located on the seacoast 15 miles north of Seabrook Station is 101°F which occurred in both 1964 and 2011*.
- The highest average maximum temperatures in Portsmouth, NH during the Summer months of June, July and August from 1960 to 2012 are*:
  - June: 80.8°F (1999)
  - July: 83.5°F (1994)
  - August: 83.7°F (2002)

*NOAA/National Weather Service historical data for the State of New Hampshire.

3.6. Planned Protection of FLEX Equipment

The SEPS gensets are protected from the elements by weather-proof enclosures and the engine cooling systems contain the required amount of glycol anti-freeze to protect the engines to at least minus 22°F. The road to the SEPS gensets is included in the site snow and ice response plan. The site snow and ice response plan also includes steps to clear snow around the SEPS gensets air intakes (Ref. 6.50). The portable FLEX Equipment is stored within the protected area in the Service Water Pump House (SWPH) unused Unit 2 bays. The SWPH is designed to survive design basis events including hurricanes, tornadoes and tornado missiles. The existing entrance is modified with a new Barrier I missile door to allow for rapid deployment while maintaining the structure's missile protection. On site deployment routes for FLEX equipment from the FESB are described in Section 3.7.1.

During a Beyond Design Basis flooding or hurricane event, access to areas in the plant could be restricted due to flood waters and high winds. Seabrook flooding events are short in duration. A forecast of a severe hurricane impacting the site will result in plant shutdown, reducing plant heat load and extending available coping time [Ref. 6.45]. The strategy to maintain core cooling was developed such that access to Phase 2 FLEX equipment and access to potentially environmentally harsh areas is not required until the high winds have subsided and the flood waters receded.

FLEX equipment (i.e., pumps, diesel generators, etc.) has been selected to be capable of operating in hot weather at or in excess of the regional maximum 100-year return period temperature of 100.9°F, which is below the NEI 12-06 high temperature threshold of 110° F discussed in NEI 12-06. It is not expected that FLEX equipment and deployment would be affected by high temperatures. The FLEX equipment is commercial robust quality. Most is designed for outdoor operation in harsh environments. Equipment storage locations have a maximum design temperature of 104°F. The normal temperatures in these locations will typically be significantly less; so long term storage of FLEX equipment in these locations will not affect equipment function.

Some debris removal equipment is stored inside the SWPH in order to be protected from the applicable external events such that the equipment is likely to remain functional and deployable to clear obstructions from the pathway between the equipment's storage location and its deployment location. This includes a tow vehicle (tractor) equipped with a bucket loader, and portable debris clearing material such as chain saws. Additional heavy equipment is located in diverse locations on the site.

The Seabrook FLEX program document [Ref. 6.4] stipulates the required administrative controls for FLEX equipment and the basis for their design and use. As outlined in the program document, existing plant configuration control procedures have been modified to ensure that changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies.

3.7. Planned Deployment of FLEX Equipment

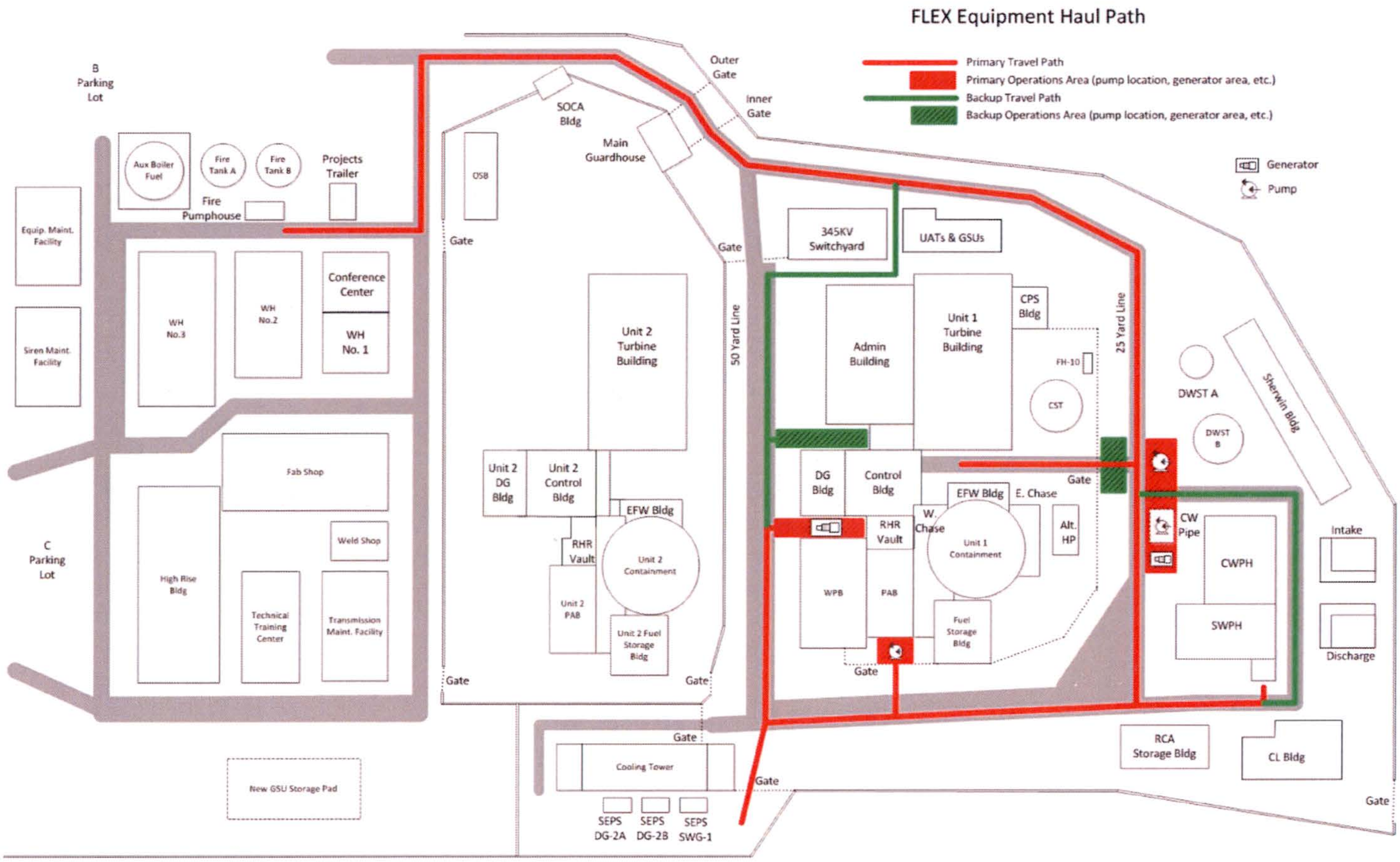
3.7.1. Haul Paths and Accessibility

Pre-determined, preferred haul paths have been identified and documented in the FSGs.

Figure 8 shows the haul paths from the SWPH FLEX Storage area to the various deployment locations. Because the SWPH FLEX Storage area is located within the protected area the deployment paths for Phase 2 are relatively short which minimizes the debris removal time needed to deploy. These haul paths were reviewed for potential soil liquefaction. The review report [Ref. 6.49] concluded that for the postulated ground motions the potential liquefaction results in little if any settlement and that travel would not be affected. Additionally, the chosen haul paths avoid areas with trees, power lines, narrow passages, etc., when practical.

The deployment route for some FLEX strategies traverses under the Main Steam and Feedwater piping bridge between the Turbine Building and the East Pipe Chase. While this piping bridge is non-safety related, its design and qualification includes seismic (SSE) and pipe transient loading conditions along with normal dead weight and thermal loading combinations. Thus a seismic event will not impact use of this deployment route.

Figure 8: FLEX Equipment Storage - Service Water Pump House and Haul Routes



Debris removal equipment is stored inside the Service Water Pump House protected from all hazards such that the equipment remains functional and deployable to clear obstructions to the deployment locations. Access for the FLEX pumps and generators stored in the SWPH will be through the new Barrier 1 door. This is a hinged door that opens outward. The potential for debris in this area is limited because this is within the Protected Area and many of the surrounding structures are Category I buildings. There are some Sea-Land containers and sheet metal structures that could be a source of debris. The plan for removal would be to use the debris removal tractor stored in the SWPH. If debris is blocking the door, the debris removal tractor can use the front end loader attachment to push outward on the door from the inside. If additional debris clearing is needed there are hand tools stored within the SWPH that can be used by personnel utilizing the smaller access doors. This equipment includes power saws and come-alongs. Additionally there is a large number of heavy snow removal and earth removal equipment located on-site in various locations. Although this equipment is not protected from all hazards it is diverse and redundant.

Diverse snow removal equipment is located on the site during winter sufficient to address any snow removal challenge. Additionally the FLEX tow/debris removal tractor located in the SWPH can clear snow from the storage location to the staging areas.

The potential impairments to required access are: 1) doors and gates, and 2) site debris blocking personnel or equipment access. The coping strategy to maintain site accessibility through doors and gates is applicable to all phases of the FLEX coping strategies.

Doors and gates serve a variety of barrier functions on the site. One primary function is security and is discussed below. However, other barrier functions include fire, flood, radiation, ventilation, tornado, and high energy line break (HELB). As barriers, these doors and gates are typically administratively controlled to maintain their function as barriers during normal operations. Following a BDBEE and subsequent ELAP event, FLEX coping strategies require the routing of hoses and cables to be run through various barriers in order to connect FLEX equipment to station fluid and electric systems at connection points within seismically robust structures. For this reason, certain barriers (gates and doors) will be opened and remain open. This deviation from normal administrative controls is acknowledged and is acceptable during the implementation of FLEX coping strategies.

The ability to open doors for ingress and egress, ventilation, or temporary cable/hose routing is necessary to implement the FLEX coping strategies. Security doors and gates that rely on electric power to operate opening and/or locking mechanisms will be opened using keys that are provided to Operations personnel. The Security force will initiate an access contingency upon ELAP as part of the Security Plan. Access to the Owner Controlled Area, site Protected Area, and areas within the plant structures will be addressed under this access contingency as implemented by security personnel.

The deployment of onsite FLEX equipment to implement coping strategies beyond the initial plant capabilities (Phase 1) requires that pathways between the SWPH and various deployment locations be clear of debris resulting from BDBEE seismic, high wind (tornado), or flooding conditions.

The stored FLEX equipment includes a tow vehicle equipped with front end bucket and rear tow connections to move or remove debris from the needed travel paths.

Vehicle access to the Protected Area (PA) is via the double gated truck trap at the north side of the PA. As part of the Security access contingency, the truck trap gates will be manually controlled to allow delivery of FLEX equipment (e.g., generators, pumps) and other vehicles such as debris removal equipment into the PA. An alternate path into the PA is available via the south access gate near the SWCT.

Phase 3 of the FLEX strategies involves the receipt of equipment from offsite sources including the NSRC and various commodities such as fuel and supplies. Transportation of these deliveries can be through airlift or via ground transportation. Seabrook Station is partnered with the Strategic Alliance for Flexible Emergency Response (SAFER) to ensure delivery of required FLEX equipment from the NSRC. There are two onsite staging areas located outside the protected area for NSRC equipment receipt (primary and alternate, see Figures 9 and 10). Debris removal for the pathway between the staging areas and the final locations may be required. See Figure 11 for primary and alternate travel paths. The same debris removal equipment used for on-site pathways will be used to support debris removal to facilitate road access to the site. Deployment routes have been analyzed for soil liquefaction, and this analysis showed that the staging areas and at least one travel path will be available and useable following a seismic event [Ref. 6.49].

Figure 9: Primary Equipment Staging Area B

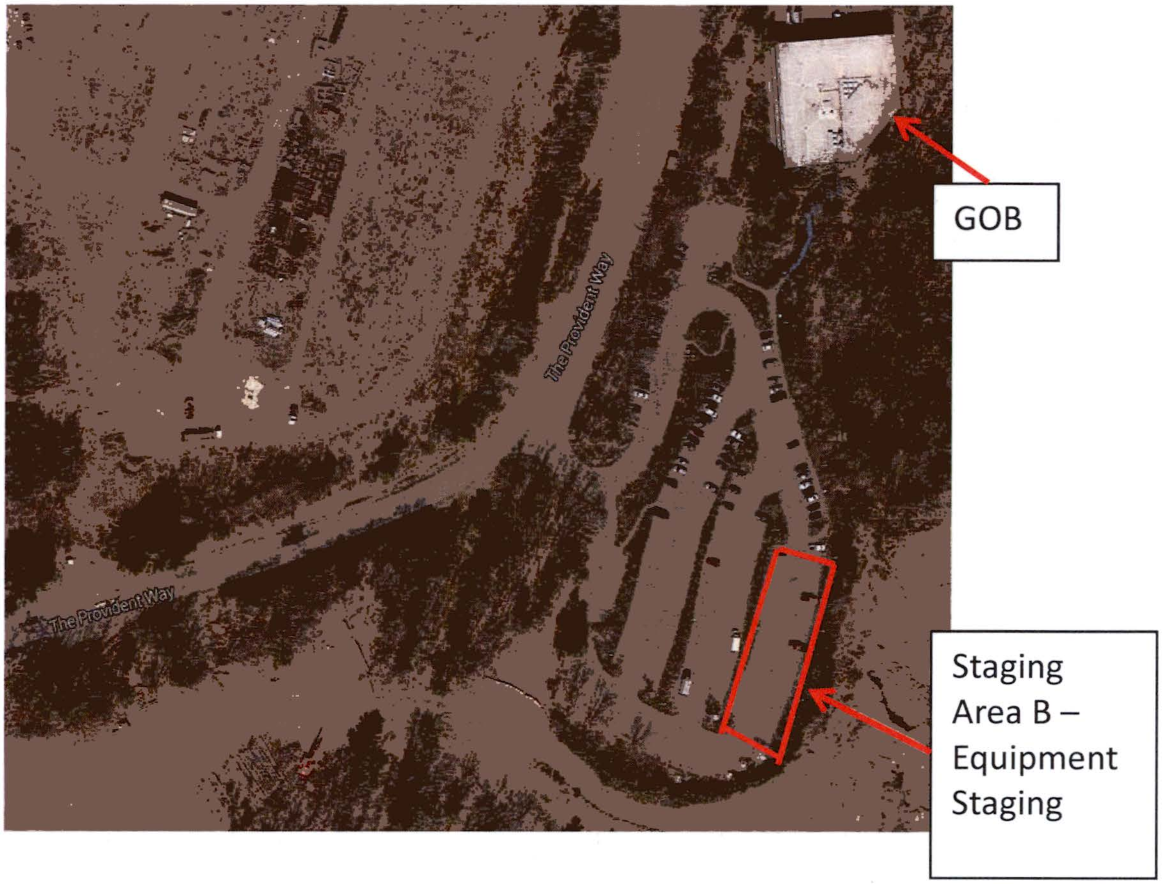


Figure 10: Alternate Staging Area B and Primary Helipad

Figure 11: Travel Paths

3.7.2. FLEX Equipment Transport, Connection and Refueling

3.7.2.1. RCS Cooling and Heat Removal FLEX Equipment Deployment

The FLPP provides the backup for the TDEFW pump during Phase 2. The portable, diesel driven FLPP will be transported from the SWPH FLEX Storage area to a location near the CST. The FLPP primary suction and discharge connections are located inside the seismic Category I, missile protected EFW Pumphouse.

In the case where the CST is unavailable, the FLPP will be deployed to take suction from one of the alternate water supplies (see Table 3). The primary discharge connection is to the EFW discharge header located inside the seismic Category I, missile protected EFW Pumphouse, and the backup injection locations are the Feedwater supply header drain valves in the seismic Category I, missile protected east and west pipe chases.

There are a number of options for CST refill. The preferred option is gravity feed demineralized water from the DWSTs to the CST through existing piping. If this option is not available, CST makeup can be provided using a variety of pumps and water sources, including using the Submersible Pump and the Unit 2 Circulating Water Piping Cistern to flow water to the TDEFW suction piping inside the seismic Category I, missile protected EFW Pumphouse. The alternate water sources are shown in Table 3, with demineralized water being preferred followed by potable water.

3.7.2.2. RCS Makeup (Modes 6/5 w/o SGs) FLEX Equipment Deployment

The portable FLPP stored in the SWPH will be deployed to the south side of the Primary Auxiliary Building. A suction hose will connect the RWST SFP makeup header to the FLPP suction using an adapter. The FLPP will discharge through hose to the charging pump discharge header via a temporary valve installed during modes 5 and 6, using an adapter. The connections are located in Cat I structures and accordingly, these connections are protected against all hazards.

3.7.2.3. SFP Makeup FLEX Equipment Deployment

For the primary SFP makeup strategy there is no equipment deployment, as the gravity drain from the RWST to the SFP uses existing piping. If this path is unavailable, equipment deployment will depend on the strategy chosen from among the available options. If the Submersible Pump is used to provide makeup to the SFP, the Submersible Pump and its associated 30 kW generator will be deployed to the Unit 2 Circulating Water Piping Cistern, a hose will be attached to the Submersible Pump, and the Submersible Pump will be lowered into the cistern. Hose will be run from the submersible pump to the eastern FSB door and connected to the hoses that have been run to the monitor nozzles at the SFP.

3.7.2.4. 480V Repowering FLEX Equipment Deployment

If SEPS is available, it will be used to provide power to support operation of equipment needed to shut down the plant and maintain it in a safe shutdown condition. In this case the FLEX 480 VAC generator can be used to provide power for additional instrumentation.

If SEPS is not available, the FLEX 480 VAC generator will be deployed to the slot between the Diesel Generator Building (DGB) and the Waste Processing Building. If this location is obstructed, the FLEX 480 VAC generator can also be deployed to the slot between the DGB and the Administration Building. To expedite deployment of the FLEX 480V generator, it will initially be fueled from one of the DG day tanks.

The FLEX 480V generator is initially used to power transformer/ distribution center units in the B Essential Switchgear Room and the B Diesel Generator Room via flexible, weatherproof cables and color coded connectors. The cables needed for the initial connections are pre-staged in the Train B Essential Switchgear Room and the B DG Room to speed initial response. Additional cables for the train A Essential and Non-Essential Switchgear distribution center units are stored in the SWPH. The transformer/distribution center units are used to power the A and B train portable battery chargers using pre-made cables with connectors. They are also used to power two motor control centers (via 480V weld receptacles) to support Control Room lighting and receptacles (to allow easy use of temporary fans). As skilled workers arrive, further connections are made to power additional equipment. If B train equipment is unavailable, the A train can be substituted.

Portable fans will initially be used to provide vital battery room ventilation until such time as the plant battery room fans can be powered from the FLEX 480V generator.

3.7.3. FLEX Deployment Staffing and Communications

The Seabrook staffing Phase 2 staffing assessment was provided to the NRC and following questions during the on-site audit, a revised staffing assessment was provided [Ref. 6.73 and Ref. 6.74]. The Phase 2 staffing studies showed that Seabrook can respond to an ELAP when at the minimum on-shift staffing levels for a minimum of six hours (at which time offsite resources are assumed to arrive). The Validation Report (Appendix H of Ref. 6.4) confirmed that FLEX strategies can be implemented with on-site staffing including that supplemented with off-site support in latter phases post DBDEE. As described in Section 3.5.2, additional personnel are required on site in advance of a major hurricane and thus would be available earlier in that scenario [Ref. 6.45 and Ref.6.58]. The NRC staff concludes that the

Phase 2 staffing submittal adequately addresses the response strategies needed to respond to a BDBEE using procedures and guidelines. The NRC staff will verify the implementation of the staffing capabilities through the inspection program (Ref. 6.84).

The Seabrook communications assessment was provided to the NRC [Ref. 6.51] and additional information was provided to the NRC to respond to generic technical issues identified by the NRC [Ref. 6.52]. Should normal communications methods be disrupted, the Seabrook communications plan utilizes the in plant telephone system, the sound powered telephone system, and portable radios for communications on site. Satellite telephones are used for communication with offsite facilities and offsite response organizations, as well as the NRC. A UHF radio system is the primary communications method between the EOF and offsite field monitoring teams.

The communications assessment identified enhancements to ensure that communications capabilities are maintained for responding to emergency event. These enhancements included backup power supplies for on-site telephone communications and for charging batteries for radios and satellite telephones, radio system enhancements, and staging of satellite telephones and antennas [Ref. 6.51]. These enhancements have been implemented.

The Seabrook staffing and communication assessments utilized the guidance from NEI 12-01 [Ref. 6.76] that was accepted by the NRC [Ref. 6.77].

3.7.4 FLEX Equipment Refueling Deployment

The FLEX strategies for maintenance and/or support of safety functions involve several elements including the supply of fuel to the SEPS or diesel powered portable generators and pumps, as well as tow and debris removal vehicles. The general coping strategy for supplying fuel oil to SEPS and to diesel driven portable equipment, i.e., pumps and generators is to draw fuel oil out of the Emergency Diesel Generator Fuel Oil Storage Tanks (EDGFOSTs). There are two EDGFOSTs. Each EDGFOST is separately located in the respective EDG rooms within a Seismic Category I structure and is protected from seismic, wind, missiles, temperature extremes and flooding. Each tank contains greater than 62,000 gallons of fuel oil [see TS 3/4.8.1 in Ref.6.59]. Diesel fuel in the fuel oil storage tanks is routinely sampled and tested to assure fuel oil quality is maintained to ASTM standards. This sampling and testing surveillance program also assures the fuel oil quality is maintained for operation of the station Emergency Diesel generators.

Fuel from the EDGFOSTs is used to fill a portable diesel fuel transfer cart. This cart is stored in the SWPH FLEX Storage area. The transfer cart has a capacity of approximately 1,000 gallons. A portable light tower, stored in the SWPH, is deployed to provide 220V power to one of two electric transfer pumps installed in the EDG building, one pump near each EDGFOST. The transfer cart will be deployed from the Service Water pump house to a location outside the diesel building where it will be filled, and then used to refill the FLEX equipment fuel tanks including the SEPS' tanks. The transfer cart has its own diesel driven pump to offload fuel to the larger FLEX equipment, and a hand operated pump to refuel smaller equipment. To expedite the deployment of the 405 kW generator, the first fill of this component will be performed by gravity drain from one of the Emergency Diesel Generator day tanks, each of which contain a minimum of 600 gallons. This refueling operation was included in the validation of this time sensitive step.

FSG-5.1.1 [Ref. 6.60] provides operating instructions, fuel burn up rates and fueling strategies for all portable diesel driven FLEX equipment.

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Each SEPS genset has a 6050 gallon fuel oil storage tank with a Technical Requirement TR-31-3.1 minimum value of 4775 gallons. From manufacturer's data (Ref. 6.61), the fuel consumption rate for each generator at rated load is approximately 172 gallons per hour. Assuming that SEPS fuel level is at the TR-31-3.1 required minimum level at the time of the Extended Loss of AC Power (ELAP) event, each genset can power ELAP loads for greater than 27 hours. It is anticipated that the operating crew will evaluate refueling strategies for SEPS relatively early in the event. Fuel oil shipments and storage tanks for the SEPS diesels are sampled to ensure reliable operation of the diesels [Ref. 6.78]. The transfer cart has sufficient capacity to support continuous operation of the major FLEX equipment expected to be deployed and placed into service following a BDB external event. Each of the two Diesel Oil Storage Tanks, which are protected from BDB hazards, have adequate capacity to provide a fully loaded SEPS diesel with diesel fuel for >10 days. Fuel consumption when the alternate strategy is employed would be significantly less.

The transfer cart has sufficient capacity to support continuous operation of the major FLEX equipment expected to be placed into service following a BDBEE. Based on a 35 gpm fill rate from a DGFOST to the transfer cart, the cart will take less than 30 minutes to fill. Based on a 35 gpm transfer rate from the cart, site FLEX equipment refueling will be similarly rapid. Diesel fuel from off-site sources will be preferred to supplement the large LUHS pump and 4kV generators to be received from the NSRC.

Portable, diesel driven FLEX equipment is stored with a half tank or less of fuel. Periodic testing uses some fuel and requires adding fuel to the tanks either prior to the testing or after testing is complete. The stored fuel is thus periodically refreshed.

The BDB external event response strategy includes a very limited number of small support engine powered equipment (chain saws and chop saws).

These components will be re-fueled using small portable containers of fuel located in the SWPH.

3.8. Offsite Resource Utilization

The industry has established two NSRCs to support utilities during a BDBEE. Seabrook Station has established contracts with the Pooled Equipment Inventory Company to participate in the process for support of the NSRCs as required. Each NSRC will hold five sets of equipment, four of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. In addition, on-site FLEX equipment hose and cable end fittings are standardized with the equipment supplied from the NSRC, or adaptors are provided. In the event of a BDBEE and subsequent ELAP/LUHS condition, equipment will be moved from an NSRC to a local assembly area. For Seabrook, the local assembly areas are the Manchester-Boston Regional Airport or alternately the Portsmouth International Airport at Pease. From there, equipment can be taken to the Seabrook site and staged at the onsite staging areas by helicopter if ground transportation is unavailable.

Communications will be established between the Seabrook plant site and the SAFER team via satellite phones or other means and required equipment moved to the site as needed. First arriving equipment will be delivered to the site within 24 hours from the initial request. The default order at which equipment is delivered is identified in the site specific "SAFER Response Plan for Seabrook Station" [Ref. 6.62].

The equipment stored and maintained at the NSRC for transportation to the local assembly area to support the response to a BDBEE at Seabrook is listed below. This includes the equipment that is specifically credited in the FLEX strategies for Seabrook but also lists the equipment that will be available for backup/replacement should on-site equipment break down. Since all the equipment will be delivered to the local assembly area, the time needed for the replacement of a failed component will be minimal.

- Two Medium Voltage Generator (4160 V) Generators
- Low Voltage (480 V) Generator
- High Pressure Injection Pump
- Low Pressure/Medium Flow Pump
- Low Pressure/High Flow Pump
- SG/RPV Makeup Pump
- Diesel Fuel Transfer Equipment
- Electrical Cable, Hoses, Connectors
- Suction Lift Booster Pump

3.9. Habitability and Operations

Per the guidance given in NEI 12-06, FLEX strategies must be capable of execution under the adverse conditions (unavailability of installed plant lighting, ventilation, etc.) expected following a BDBEE resulting in an ELAP/LUHS. Following a BDBEE and subsequent ELAP event, if the SEPS is available, one train of ventilation is maintained. In case adequate lighting is not available, flashlights, head lamps and spare batteries are maintained in FLEX cabinets in the Control Room, Train B Essential Switchgear, and in the SWPH; flashlights are maintained in numerous other FLEX cabinets.

If the SEPS is not available, ventilation providing cooling to occupied areas and areas containing FLEX strategy equipment will be lost. Doors to energized cabinets and room doors will be opened and temporary fans/heaters will be used to provide ventilation/cooling/heating as necessary.

Loss of ventilation analyses [Refs. 6.63 and 6.64] were performed to quantify the maximum steady state temperatures expected in specific areas related to FLEX implementation. These analyses check that environmental conditions remain acceptable for personnel habitability and within equipment qualification limits, or provide recommended actions where these limits may be approached or exceeded.

3.9.1. Equipment Operating Conditions

The key areas identified for all phases of execution of the FLEX strategy activities are the Main Control Room, EFW Pump House, Main Steam and Feedwater Pipe Chases, and the Essential Switchgear Rooms (including the Battery Rooms). These areas have been evaluated to determine the temperature profiles following an ELAP/LUHS event [Refs. 6.63 and 6.64]. These evaluations show that low temperatures are not a concern during an ELAP event. They also show that with the exception of the Main Control Room, the elevated temperatures that could be experienced in an ELAP event do not affect the qualification of equipment required to support FLEX strategies. The doors to the Main Control Room will be opened as required. Direction is provided for deployment of portable fans if needed to further accommodate the heat load in the Main Control Room. In other areas where elevated temperatures may occur during an ELAP event, area temperatures are monitored and direction is provided for deployment of portable fans as needed. When Vital Battery Chargers are verified in service, the associated Vital Battery Room fan is checked in service to prevent any significant hydrogen accumulation during battery charging.

An evaluation was performed to address the concern with loss of heat tracing during cold weather conditions (Ref. 6.72). This evaluation determined that specific instruments and flowpath piping could be affected by low temperatures either through freezing or boron precipitation. FSG-5 and FSG-5.1 include steps to monitor temperatures in the areas where these components are located and deploy temporary or permanent heaters as appropriate.

3.9.2. Area Habitability

The doors to the Main Control Room will be opened as required. Direction is provided for deployment of portable fans if needed to further accommodate the heat load in the Main Control Room for long term habitability. In other areas where elevated temperatures may occur during an ELAP event, area temperatures are monitored and direction is provided for deployment of portable fans as needed.

3.10. Water Sources

Table 3 provides a list of the potential water sources that may be used to provide cooling water to the SGs or the SFP. This table lists their capacities and notes their seismic capability and missile protection. Descriptions of the preferred water usage sources are provided in the preferred order of utilization based on water quality. The CST volume listed is protected from all hazards and provides adequate inventory for the transition to RHR with the SEPS/SWCT available. Without the SEPS or SWCT available, deployment of one of the strategies used to feed the SGs is performed prior to the depletion of the CST. At least two water sources would survive all applicable hazards for Seabrook and are credited for use in FLEX strategies (CST and Unit 2 Circulating Water Piping Cistern).

While they have not been evaluated for seismic tolerance and are not missile protected, the Fire Protection Tanks and DWSTs are located about 1200' from each other and thus have some protection through separation.

The BATs are the preferred source for RCS makeup. The RWST is the preferred source for SFP makeup, and can also be used for RCS makeup.

The BATS are a protected source of borated water.

The RWST water is demineralized and borated. The RWST is qualified for seismic and flood hazards and is located within a Seismic Cat I building, but is not protected from all missile hazards.

The results of the water source evaluation show that the credited, fully protected, on-site water sources provide for an adequate EFW supply source for the duration of Phase 2. In Phase 3 RCS cooling is provided by SEPS/SWCT or delivery and deployment of the NSRC 4160V Generators and LUHS pumping system and transition to Shutdown Cooling.

3.11. Shutdown and Refueling Analyses

Seabrook Station will abide by the Nuclear Energy Institute position paper entitled "Shutdown/Refueling Modes" addressing mitigating strategies in shutdown and refueling modes [Ref. 6.65]. This position paper is dated September 18, 2013 and has been endorsed by the NRC staff [Ref. 6.66].

3.12. Procedures and Training

3.12.1. Procedures

The inability to predict actual plant conditions that require the use of FLEX equipment makes it impossible to provide specific procedural guidance. As such, the FSGs provide guidance that can be employed for a variety of conditions. Clear criteria for entry into FSGs ensures that FLEX strategies are used only as directed for BDB external event conditions, and are not used in lieu of existing procedures. ECA-0.0 Loss of All AC Power is the implementing procedure for mitigating strategies for ELAP coincident with loss of normal access to the UHS. No additional malfunctions are assumed. When the determination is made that AC power cannot be restored within four hours by using credited site blackout equipment (offsite power or the EDGs), transition to the FSGs will be made. If the SEPS is available to re-power an emergency bus, FSG-0.0 is entered; if not, FSG-0.1 is entered. Each FSG will act as the governing document to determine which support FSG strategy will have the most likelihood of success, based on damage assessment and equipment availability. The support FSGs direct deployment and operation of FLEX equipment which is either installed or is located in protected storage. SEPS is used as the primary method for coping in an ELAP event. SEPS is permanently mounted and is protected from all hazards with the exception of wind driven missile related events. Portable FLEX pumps and generators are the alternate method of coping in an ELAP event, and are stored in the SWPH FLEX Storage area. Deployment procedures and maps direct setup, staging, layout and connection points for equipment, temporary hoses and cables. FSGs control the restoration of core cooling, RCS inventory makeup, SFP makeup and containment integrity.

FLEX strategy support guidelines have been developed in accordance with PWROG guidelines. FSGs have been reviewed and validated by the involved groups to the extent necessary to ensure the strategy is feasible. Validation has been accomplished via walk-throughs or drills of the guidelines and abides by the draft guidance provided by NEI and incorporated into NEI-12-06. The results confirm Seabrook's capability to perform strategies within applicable time frames [see Appendix H of DFCS, Ref. 6.4].

FSG maintenance will be performed by the Operations Department group via PR8.1, FLEX Support Guideline (FSG) Maintenance [Ref. 6.75].

3.12.2. Training

The NextEra Energy Nuclear Training Program has been revised to assure personnel proficiency in the mitigation of BDBEE is adequate and maintained. These programs and controls were developed and have been implemented in accordance with the Systematic Approach to Training Process.

Initial training was provided and periodic training will be provided to site emergency response decision makers on BDBEE strategies and implementing guidelines. Personnel assigned to direct the execution of mitigation strategies for BDBEE have received the necessary training to ensure familiarity with the associated tasks, instructions, and mitigating strategy time constraints.

Care has been taken to not give undue weight (in comparison with other training requirements) for Operator training for BDB external event accident mitigation. The testing/evaluation of Operator knowledge and skills in this area have been similarly weighted. Operator training includes familiarity with equipment from the NSRC.

"ANSI/ANS 3.5, Nuclear Power Plant Simulators for use in Operator Training" certification of simulator fidelity is considered to be sufficient for the initial stages of the BDBEE scenario until the current capability of the simulator model is exceeded. Full scope simulator models will not be upgraded to accommodate FLEX training or drills.

Where appropriate, integrated FLEX drills will be organized on a team or crew basis and conducted periodically, with all time-sensitive actions to be evaluated over a period of not more than eight years. It is not required to connect/operate permanently installed equipment during these drills.

3.13. Maintenance and Testing

FLEX mitigation equipment was subject to initial acceptance testing, and subsequent periodic maintenance and testing will occur to verify proper function. Seabrook complies with the EPRI generic industry program for maintenance and testing of FLEX equipment (EPRI Report 3002000623, Ref. 6.67) as delineated in NRC endorsement letter dated October 7, 2013 [Ref. 6.68]. Preventive maintenance procedures and intervals have been established to ensure FLEX equipment is reliably maintained. Similarly, surveillance procedures and intervals have been created for functional and performance testing of applicable FLEX equipment as well as equipment inventory of all required FLEX equipment and spares.

The unavailability of plant equipment is controlled by existing plant processes such as the Technical Specifications and Technical Requirements. When plant equipment which supports FLEX strategies becomes unavailable, then the FLEX strategy affected by this unavailability does not need to be maintained during the unavailability. Seabrook has not adopted the N+1 provision for spare equipment due to the planned utilization of SEPS as a primary strategy in all but wind-driven missile scenarios. To compensate for this, the unavailability period for FLEX equipment used for SEPS not available strategies will be 45 days as opposed to the 90 days recommended in NEI 12-06. Connections to plant equipment required for FLEX strategies can be unavailable for 90 days provided alternate capabilities remain functional.

4. Technical Evaluation of Order EA-12-051

4.1. Levels of Required Monitoring

Three SFP levels were identified. These consist of the level required for normal SFP cooling function (23 ft. 4 inches plant elevation), the level required to provide approximately 13 ft. of water shielding above the fuel (10 ft. 9-1/2 inches plant elevation) and the level where the fuel remains covered (-2 ft. 2-/12 inches plant elevation) [Ref. 6.69].

4.2. Design Features

4.2.1. Instruments

The Spent Fuel Pool Level Indicator (SFPLI) consists of two independent channels of guided wave radar probes that are permanently installed to detect the water level inferred from the reflection of the electromagnetic energy. Instrument design and installation adopts requirements provided in NRC and NEI guidance [Refs. 6.14, 6.15].

4.2.2. Arrangement

The SFPLI level instruments are installed at opposite ends of the west wall of the SFP, separated by 18' 6". Detector elevation encompasses the range of water level in the SFP required to be monitored. Power supplies and transmitter electronics are located remotely to maximize radiation shielding provided by the SFP and Fuel Storage Building structure.

4.2.3. Mounting

The SFPLI detector and associated components are designed and installed as Seismic Category I components.

4.2.4. Qualification

The SFPLI instrumentation quality and expected reliability has been demonstrated by design, analysis, operating experience and testing with operating and environmental conditions applicable or bounding to the Seabrook environmental conditions following an extended loss of all AC power with concurrent loss of ventilation and SFP cooling [Ref. 6.69].

4.2.5. Independence

The SFPLI primary channel components have been constructed and arranged to be redundant and independent of the backup channel through separation and isolation of sensors, power supplies and cabling.

4.2.6. Power Supplies

The SFPLI channels are powered by separate sources of 120VAC power. Backup batteries provide at least 72 hours of power if 120 VAC power is lost. Provisions are also provided to power the SFPLI channels from a portable generator.

4.2.7. Accuracy

The SFPLI accuracy is +/- 3.0". Operating Procedures establish the SFP levels with 24" of margin for normal fuel pool cooling operation and FSGs establish the SFP levels where alternate makeup to the SFP will be initiated.

4.2.8. Testing

Factory Acceptance Testing and On-site Modification Acceptance Testing were performed for function and calibration of the new SFPLI's. Periodic calibration will ensure proper equipment operation.

4.2.9. Display

The SFPLI displays are located in the "A" and "B" train Essential Switchgear Rooms, assuring accessibility regardless of conditions following a BDBEE.

4.3. Programmatic Controls

4.3.1. Training

Training impact resulting from the installation of the SFPLI was reviewed for operations, maintenance, engineering and simulator. Training lesson plans, class scheduling and sessions were completed to implement the results of these reviews.

4.3.2. Procedures

Operating and maintenance procedures have been developed for SFPLI utilization and reliability. FLEX support guideline FSG-11 lists the SFP Level Indicators as sources to obtain SFP level; FSG-5 provides instructions for connecting the SFP Level Indicators to an alternate power source.

4.3.3. Testing and Calibration

Instrumentation calibration procedures and preventive maintenance work instructions have been issued for each channel of SFPLI.

5. Acronyms

A/C	Air Conditioning
AC	Alternating Current
ASDV	Atmospheric Steam Dump Valve
BAT	Boric Acid Tank
BDBEE	Beyond-Design-Basis External Events
CGC	Combustible Gas Control
CFR	Code of Federal Regulations
CST	Condensate Storage Tank
CR	Control Room
DC	Direct Current
DGB	Diesel Generator Building
EDGFOST	Emergency Diesel Generator Fuel Oil Storage Tanks
ELAP	Extended Loss of Alternating current Power
EOP	Emergency Operation Procedure
EPRI	Electric Power Research Institute
ERO	Emergency Response Organization
ESEP	Expedited Seismic Evaluation Process
FHPP	FLEX High Pressure Pump
FLPP	FLEX Low Pressure Pump
FSG	FLEX Support Guidelines
GMRS	Ground Motion Response Spectra

LIP	Local Intense Precipitation
LOCA	Loss of Coolant Accident
LUHS	Loss of Ultimate Heat Sink
MSL	Mean Sea Level
NEI	Nuclear Energy Institute
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
NSRC	National SAFER Response Center
NTTF	Near-Term Task Force
OIP	Overall Integrated Plan
PCCW	Primary Component Cooling Water
PMH	Probable Maximum Hurricane
PWROG	PWR Owner's Group
RCS	Reactor Coolant System
RHR	Residual Heat Removal
RWST	Refueling Water Storage Tank
SBK	Seabrook Station
SBO	Station Blackout
SEPS	Supplemental Emergency Power System
SFP	Spent Fuel Pool
SFPLI	Spent Fuel Pool Level Indicator
SG	Steam Generators
SPS	Standard Project Storm
SSE	Safe Shutdown Earthquake
SW	Service Water

SWCT	Service Water Cooling Tower
TDEFW	Turbine Driven Emergency Feedwater
TDH	Total Developed Head
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink

6. References

(D) – Docketed, (ND) – Not Docketed

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6.4. ND DFCS, Rev. 1, Diverse and Flexible Coping Strategies (FLEX) Program

6.5. D NEE Letter SBK-L-15152, NextEra Energy Seabrook LLC's Request for Schedule Relaxation from NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated July 23, 2015 (ML15209A581)

6.6. D NRC Letter dated October 4, 2015, Seabrook Station Unit 1 – Relaxation of the Schedule Requirements of Order EA-12-049, "Issuance of Order to Modify Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (TAC NO. MF0836), (ML15244A045)

6.7. D Seabrook Station Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, (Order Number EA-12-049), February 26, 2013 (ML13063A438)

6.8. D NextEra Energy Seabrook, LLC's First Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-

Basis External Events, (Order Number EA-12-049), August 28, 2013 (ML13247A178)

6.9. D NextEra Energy Seabrook, LLC's Second Six-Month Status Report in Response to the 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 27, 2014 (ML14064A188)

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6.11. D NextEra Energy Seabrook, LLC's Fourth 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 27, 2015 (ML15068A021)

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6.22. ND EC 282426, SBC-227-CALC Revision 5 DC System Evaluation For Station Blackout And Beyond Design Basis External Events

6.23. ND C-X-1-20719-CALC, Rev. 1, Determination of Water Inventory Required for RCS Heat Removal During ELAP

6.24. ND ECA-0.0, Rev. 47, Loss of All AC Power

6.25. ND C-X-1-20718-CALC, Rev. 1, Diverse and Flexible Coping Strategy Hydraulic Analysis

6.26. ND FSG-0.0, Rev. 0, Extended Loss of All AC Power With SEPS

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ADDENDUM 1

SEPS GENSETS

ADDENDUM 2

Technical Descriptions of SEPS and the SWCT

Supplemental Emergency Power System (SEPS)

Seabrook Station is a 4-hour AC-independent coping plant with respect to a site blackout event. SEPS is a non-safety related backup power system that is not currently credited as a 'site blackout diesel' or an 'alternate AC source', and is also not credited in the UFSAR accident analyses. The station's 4-hour coping time is not impacted by the availability of SEPS.

SEPS consists of two air-cooled, 2640 KW (net rated load), 4.16kV diesel generating sets (gensets), that can be manually aligned to either Bus E5 or E6 Emergency Bus (Bus E6 preferred). In the event of a Loss of Offsite Power, the SEPs engines start. Manual breaker closure will power the Emergency Bus aligned to SEPS.

The SEPS gensets are pre-positioned FLEX equipment for the strategies described in this report. Both SEPS gensets are seismically robust and installed above the current site licensing basis flood plain. The genset enclosures are designed to protect them from, at minimum, 120 mph hurricane force winds. SEPS is not provided with wind-driven missile protection beyond these weather-proof enclosures.

Each SEPS genset has fuel capacity for greater than 24 hours of operation at rated load. Analysis indicates that either of the redundant gensets has the capacity to power required ELAP loads. Consequently, an Emergency bus can be powered for longer than 48 hours with the fuel supply contained in both gensets.

SEPS supports extending the allowed outage time for the Emergency Diesel Generators (EDG) from 72 hours to 14 days. When an EDG is removed from service and the 14 day allowed outage time is entered, the SEPS is aligned up to provide power to the opposite train 4160V Emergency Bus. Thus it is available for FLEX use to power that bus, and if the other bus is available, can be manually aligned to power that bus.

Service Water Cooling Tower (SWCT)

NEI 12-06 assumptions include loss of normal access to the UHS. In Seabrook's case that would be the train-related ocean service water pumps in the Service Water Pumphouse.

The SWCT is a standby UHS that is part of station design. The SWCT is a Seismic Category I structure. The electrical equipment room is above the current site licensing basis flood plain. The SWCT's function is to provide cooling water to the safety-related Service Water system should a seismic event partially collapse the intake and/or discharge cooling water tunnels to the Atlantic Ocean.

The SWCT consists of a large basin of fresh/brackish water (approx. 4 million gallons), two train-related SWCT pumps, and three train-related forced draft fans. SWCT design can support at least 7 days of post-Loss of Coolant Accident LOCA) heat load operation before basin makeup is required. The ELAP heat load is smaller than the postulated post-LOCA heat load, therefore a longer period of SWCT operation is expected before basin makeup would be required.

Basin makeup is normally provided from the potable water system or the station firemain. Makeup can also be provided by a Technical Specification-required portable diesel-driven pump that is pre-staged in the Seismic Category I Service Water Pumphouse.