NEXTera® ENERGY SEABROOK

February 27, 2015
SBK-L-15025
Docket No. 50-443

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

Seabrook Station

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)

References:

1. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012 (ML12054A736)
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, dated August 29, 2012 (ML12229A174)
3. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, dated August 2012 (ML12242A378)
4. NextEra Energy Seabrook, LLC 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), dated October 26, 2012 (ML12311A013)
5. NextEra Energy Seabrook, LLC 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), dated February 26, 2013 (ML13063A438)
6. NextEra Energy Seabrook, LLC 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), dated August 28, 2013 (ML13247A178)
7. NextEra Energy Seabrook, LLC Second Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for

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Mitigation Strategies for Beyond-Design-Basis External Events, (Order Number EA-12-049), dated February 27, 2014 (ML14064A188)

8. NextEra Energy Seabrook, LLC 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), dated August 26, 2014 (ML14246A193)

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 directs 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 initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the NextEra Energy Seabrook initial status report regarding mitigation strategies. Reference 5 provided the NextEra Energy Seabrook overall integrated plan.

Reference 1 requires submission of a status report at six-month intervals following submittal of the overall integrated plan. Reference 3 provides direction regarding the content of the status reports. Reference 6 provided the first six-month status report pursuant to Section IV, Condition C.2, of Reference 1, that delineates progress made in implementing the requirements of Reference 1. Reference 7 provided the second six-month status update. Reference 8 provided the third six-month status update. The purpose of this letter is to provide the fourth six-month status report pursuant to Section IV, Condition C.2, of Reference 1 (Attachment 1), that delineates progress made in implementing the requirements of Reference 1 and an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief and the basis. Also included as Attachment 2 is the revised FLEX Integrated Plan.

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 February 27, 2015.

Sincerely,

NextEra Energy Seabrook, LLC

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Site Vice President

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Attachment 1 to 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)

1 Introduction

NextEra Energy Seabrook, LLC (NextEra Energy Seabrook) developed and submitted an Overall Integrated Plan (Reference 1) in response to NRC Order EA-12-049. The Integrated Plan has been revised to describe Seabrook's current proposed diverse and flexible coping strategies (FLEX). This status report provides a copy of the revised Integrated Plan and an update of milestone accomplishments since submittal of the Overall Integrated Plan, and an update of the pending and open/confirmatory actions.

2 Milestone Accomplishments

The following milestone has been completed since the submittal of the Overall Integrated Plan:

- Submit first 6 month status report
- Submit second 6 month status report
- Submit third 6 month status report
- Submit fourth 6 month status report

3 Milestone Schedule Status

The following provides an update to Attachment 2 of the Seabrook Overall Integrated Plan (OIP) (Reference 1). The table includes the current status of each item and whether the expected completion date has changed. As noted in the original station submittal these dates are planning dates which are subject to change as design and implementation details are developed.

The following milestone target completion dates have been adjusted or added:

In the original submittal of the OIP in February 2013, NextEra Energy Seabrook included Westinghouse SHIELD® low leakage Reactor Coolant Pump (RCP) seals in all 4 RCPs as a backup strategy against significant Reactor Coolant System (RCS) leakage to Containment. The revised Integrated Plan credits the replacement of all 4 RCP seals with the SHIELD® seal technology in October 2015 during refueling outage 17. The original OIP included a missile shield for the Supplemental Emergency Power System (SEPS). While SEPS remains NextEra Energy Seabrook's primary strategy during all events with the exception of a wind-driven missile event, the missile shield is being deleted in the revised OIP. NextEra Energy Seabrook will employ a full set of portable FLEX equipment protected from all hazards for events in which SEPS is not available. Revised milestone target completion dates do not currently impact NextEra Energy Seabrook's full compliance date.

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Submit Overall Integrated Implementation Plan	February 2013	Complete	N/A
Submit 6 Month Updates:			
Update 1	Aug 2013	Complete	N/A
Update 2	Feb 2014	Complete	N/A
Update 3	Aug 2014	Complete	N/A
Update 4	Feb 2015	Complete	N/A
Update 5	Aug 2015	Not Started	N/A
Prepare engineering change packages for SEPS missile barrier RCP low leakage seals	December 2014	Cancelled	N/A
Prepare engineering change package for RCP low leakage seals	December 2014	Complete	N/A
Prepare bid for construction of SEPS missile barrier	March 2015	Cancelled	N/A
Install RCP shutdown seals in four pumps in refueling outage #17	April 2014	Contract for RCP low leakage seals awarded	October 2015
Construct SEPS missile barrier	December 2014	Cancelled	N/A
Revise / develop procedures based upon approved strategies and engineering implementation packages	December 2014	Working	October 2015
Develop required training for station staff based upon draft procedure changes and engineering change packages.	December 2014	Working	October 2015

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Procure SEPS / portable equipment refueling trailer	December 2014	Order Placed	June 2015
Submit 4th 6-month status report to NRC	February 2015	Complete	N/A
Develop PMs for refueling trailer	March 2015	Working	N/A
Store refueling trailer in Service Water Pump house	June 2015	Working	N/A
Off-site resources implementation site – RRC operational fall 2015	June 2015	Working	N/A
5th and final 6-month status report to NRC	August 2015	Not Started	N/A
Conduct walkthroughs / demonstrations of portable equipment connection points	August 2015	Working	N/A
Implement training for station staff	September 2015	Not Started	N/A
Final implementation – Order full compliance letter to NRC	November 2015	Not Started	N/A

4 Changes to Compliance Method

NextEra Energy Seabrook has received feedback in the form of NRC audit questions and subsequent teleconferences with NRC Staff reviewers. The NRC's Interim Staff Evaluation (ISE) was also received. A revised Integrated Plan and list of pending actions was uploaded to ePortal for NRC staff review on February 6, 2015.

5 Need for Relief/Relaxation and Basis for the Relief/Relaxation

NextEra Energy Seabrook currently expects to comply with the order implementation date and no relief/ relaxation is required at this time. Should the NRC staff /ISE require significant changes to the strategies defined in the revised Integrated Plan, it may be necessary for NextEra Energy Seabrook to request relief/relaxation at some time in the future.

6 Open Items from Overall Integrated Plan and NRC Interim Staff Evaluation /TER

The following Table provides a summary of the Pending Items documented in the Overall Integrated Plan:

	Overall Integrated Plan Pending Actions	Status
1	Revise ECA-0.0 to include steps to transition to FLEX Support Guidelines (FSGs) when an extended loss of offsite power event is in progress. This determination will delineate future procedural strategies and transitions.	In Progress
2	Develop FSG-0.0 attachments to include a SEPS load reduction method for an extended loss of offsite power event to control SEPS loading within the capacity of one engine.	In Progress
3	A seismic evaluation will be conducted on the connections that penetrate the upper half of the Condensate Storage Tank (CST) to determine if NextEra Energy Seabrook can take credit for the entire tank volume for Phase 1 & 2 event coping.	Complete, No credit will be taken for the non-seismic volume in the CST.
4	Develop FSG-0.0 to add a step to manually shutdown the motor-driven Emergency Feedwater (EFW) pump if the Turbine Driven (TD)EFW pump is running satisfactorily.	In Progress
5	Add an Attachment to ES-0.2, ES-0.3 and ES-0.4 that provides a table of electrical loads for responding to an extended loss of offsite power event.	Closed. Incorporated into item 2.
6	Develop a SEPS generator set (genset) refueling strategy from 1) an offsite supplier outside a 25 mile radius from the station (primary strategy), and 2) the Emergency Diesel Generator (EDG) fuel oil storage tanks using a refueling trailer stored in the Service Water (SW) Pumphouse (backup strategy). This strategy will include provisions for refueling within 24 hours in the event that only a single SEPS is functional.	In Progress

	Overall Integrated Plan Pending Actions	Status
7	Develop FSG-5 and FSG-5.1 to include a step for implementation of a SEPS genset refueling strategy.	In Progress
8	Develop a FSG for refueling SEPS from the EDG fuel oil storage tanks using a portable refueling trailer. Utilize the information contained in existing procedure OS1061.02, 'Receipt of SEPS Fuel Oil', for development of the FSG.	In Progress
9	Develop FSG-5 to include direction for connecting the backup diesel-driven air compressor to the Service Air system to restore Instrument Air system pressure.	In Progress
10	Develop required preventive maintenance actions and surveillance test procedures for the refueling trailer to be procured and stored in the SW Pumphouse.	In Progress
11	Revise AOPs to include transitions to FSG-11 and FSG-14 when Extended Loss of all AC Power (ELAP) is in progress for shutdown mode strategies..	Not Started
12	Conduct an engineering evaluation to determine if the existing hurricane enclosures for the SEPS gensets provide adequate missile protection. If protection is not adequate, develop a design change (EC) to add missile protection for the SEPS gensets.	Complete. SEPS missile protection will not be added. Other missile protected strategies are being added.(See new pending actions 24-37 below)
13	Evaluate the 'seismic robustness' of SEPS and determine if enhancements are needed with respect to the new Ground Motion Response Spectrum (GMRS) data for the site. This data will not be available until the seismic hazard re-evaluation is conducted in accordance Recommendation 2.1 of the RFI letter.	In Progress
14	Once the site flooding re-evaluation is completed in accordance with Recommendation 2.1 of the RFI letter, determine if additional flood protection is necessary for SEPS.	Not Started

	Overall Integrated Plan Pending Actions	Status
15	Formalize the Engineering assessment of ELAP load capacity for a single SEPS genset and modify procedural guidance in the applicable Emergency Operating Procedures (EOPs) and FSGs, as necessary.	In Progress
16	Evaluate the impact of missile protection barriers that may be installed to protect the SEPS gensets on the capability to implement the snow removal plan and revise the plan as necessary.	Complete. SEPS missile protection will not be added.
17	Determine if a quantity of diesel fuel will be provided from the National SAFER Response Centers (NSRCs) along with requested Phase 3 portable equipment. If not, establish a contract with a fuel supplier outside a 25 mile radius from the plant to provide fuel within 48 hours of a Beyond Design Basis External Event (BDBEE).	In Progress
18	Develop a FSG for staging and deployment of Phase 3 equipment from the RRCs into the Protected Area (PA).	In Progress
19	Develop a FSG for connecting the two 1MW generators from the NSRC to 4.16 KV Emergency Buses E5 and E6 and a 1MW generator from the NSRC to 480V Buses E53 and E63.	In Progress
20	Develop a FSG for refueling the NSRC generators or incorporate this action into the SEPS refueling FSG.	In Progress
21	Install low leakage RCP seals on all four RCPs to minimize RCS leakage into Containment.	All four seals are planned to be replaced with the low leakage seal design in October 2015.
22	Based on PWROG guidance, determine if new FSGs are required that incorporate the existing guidance provided in SAG-1, 'Inject to the SGs', and SAG-3, 'Inject to the RCS' or whether transition points to these two Severe Accident Management Guidelines (SAMGs) should be added to the applicable EOPs.	Complete, new FSGs are being developed for Steam Generator (SG) and RCS injection in the event SEPS is unavailable using alternate FLEX RCS makeup connections.

	Overall Integrated Plan Pending Actions	Status
23	Develop a method for obtaining local readings for the 12 critical parameters identified in the Integrated Plan and include in site procedures as appropriate.	Complete.
24	Develop Westinghouse FSGs to support ELAP strategies with SEPS unavailable.	In Progress
25	Develop EC to use existing below grade Unit 2 Circulating Water (CW) abandoned piping section as a holding tank for credited makeup in SG injection strategies.	In Progress
26	Perform analysis to qualify Unit 2 CW piping as a credited makeup source in seismic and missile related events	In Progress
27	Perform Gothic analysis for containment pressure & temperature response after installation of RCP shutdown seals to ensure containment integrity is not challenged without containment cooling.	In Progress
28	Perform analysis for SG feedwater quality requirements to ensure continued SG heat sink capability for 72 hours following loss of AC power.	In Progress
29	Perform analysis for RCS boration and cooldown strategies to support FSG development	In Progress
30	Complete SG, Spent Fuel Pool (SFP), and RCS makeup hydraulic analysis for FLEX strategies in modes 1-6.	In Progress
31	Complete FSG setpoint calculations and basis.	In Progress
32	Complete FLEX equipment storage building analysis and develop EC for SW pumphouse building mods.	In Progress
33	Complete site flooding analysis and add any interim actions to OS1200.03, Severe Weather Conditions.	In Progress
34	Procure site FLEX portable equipment to augment Seabrook BDBEE response strategies.	In Progress

	Overall Integrated Plan Pending Actions	Status
35	Complete ECs for plant system FLEX connections for Fire Tanks, EFW pumphouse, Demineralized Water Storage Tanks (DWSTs), and Positive Displacement Charging pump.	In Progress
36	Complete Analysis for > 8 hrs heat removal using CST.	In Progress
37	Revise the NextEra Energy Nuclear Training Program to assure personnel proficiency in the mitigation of BDBEE is adequate and maintained.	In Progress
38	Complete the travel route soil liquefaction study.	In Progress
39	Modify the SWPH entrance with a new Barrier I missile door to allow for rapid deployment with missile protection.	In Progress

7 Interim Staff Evaluation Open/Confirmatory Item Status

Open/Confirmatory Item	Status
3.2.4.8.A Verify that the enclosure for the SEPS DGs and switchgear SEP-SWG-1 provides sufficient protection of the equipment from seismic events and wind driven missiles.	The current 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 two SEPS genset enclosures, switchgear enclosure and associated transformers will be further protected from both tornado and hurricane missiles by a steel frame structure attached to the existing Seismic Category I cooling tower building with steel grating panels and designed for seismic loading. The missile shield will also be designed for a 110 mph sustained wind load. The missile shield will provide protection from the full spectrum of UFSAR missiles, but will be based on a tornado wind speed of

	200 mph and hurricane gust of 180 mph. These wind speed values differ from the UFSAR design, but are consistent with the current guidance found in the applicable Regulatory Guides for maximum wind gusts. Specifically, a tornado wind speed of 200 mph is shown in R.G. 1.76 Figure 1 for Region II. The peak hurricane wind gust for the Seabrook location shown on Figure 3 of R.G. 1.221 is 180mph. The corresponding missile velocities will be calculated consistent with the UFSAR missile spectrum. The SEPS exhaust pipes will be seismically mounted and protected from missiles until they exit the missile shield. At this point a blowout disk or open connection will be installed to protect against over pressure if evaluation shows potential for excessive backpressure from postulated crimping of the piping above the shield. The SEPS was installed originally as a non-seismic non-nuclear safety system. SEPS engines will be upgraded to meet the new EPRI GMRS for seismic. This is based on a seismic fragility analysis performed in 2012, which concluded that additional hold down bolts will be required for the engines and associated accessories, but modification of the gensets themselves was not required. To meet the augmented/expedited approach evaluation methodology, the SEPS hold down bolts will be designed to meet a bounding spectrum of the new EPRI GMRS and the existing SSE. Seismic design for the missile shield will be to the new GMRS, but additionally will remain functional for the SSE. **02/02/2015 Update:** SEPS missile barriers will not be installed. Both SEPS enclosures and exhaust piping will be seismically hardened to ensure they remain available during a seismic event. SEPS remains NextEra Energy Seabrook's primary

	strategy during all events with the exception of a wind-driven missile event. For that event, portable equipment (pumps, generators, and necessary support equipment) stored in a seismic, Category I structure, protected from all hazards, will be used to provide coping capability.
3.1.1.1.A Protection of FLEX equipment from seismic and high wind hazards – Confirm that the PDDPs and hose trailers will be adequately protected from seismic and high wind hazards.	One B5b portable diesel-driven pump (PDDP) will continue to be stored in its current structure located in the "A" parking lot outside the protected area. The associated hose and fittings are provided on a separate trailer stored in the same structure. This structure provides weather protection including high and low temperature conditions and is above the design basis flood elevation. Modification consisting of tie down anchors will be added to protect the shelter from high winds and seismic. The second PDDP pump with associated hose and fittings and one new RCS high pressure makeup pump (PDDHP) with associated hose and fittings will be stored at least 1200 feet away, in a perpendicular orientation to the typical hurricane path, from the first PDDP (or a distance evaluated based on area historical tornado size). A second new RCS high pressure makeup pump with associated hose and fittings will be stored at least 1200 feet away from first PDDHP. This ensures a PDDP pump, and a PDDHP pump will remain available during a tornado scenario. Missile protection will be accomplished based on the separation distance between the two pumps and redundancy (only one PDDP pump or PDDHP pump is used for the backup strategy). Storage will be on concrete pads away from any seismic II/I concerns at an elevation above the design basis flood and not susceptible to Local Intense Precipitation (LIP) concerns. The pumps will be tied down to the pad for wind protection and seismic movement.

	Basic environmental protection will be provided by an enclosure that will be rated for 110 mph sustained winds but will not be a seismic II/I hazard for the pumps (e.g. a wind rated fabric structure or seismic building). **02/02/2015 Update:** The PDDP's are no longer being used in the NextEra Energy Seabrook strategies. NextEra Energy Seabrook will purchase the following portable equipment for use in the alternate coping strategies (without SEPS): • FLEX Low Pressure Pump (FLLP) • FLEX High Pressure Pump (FLHP) • FLEX Submersible pump • 480V 250 KW Generator • Two 480V 30 KW Generators • Tow vehicle/debris removal tractor • Debris removal equipment • Refueling cart • Three Diesel powered light towers This equipment will be stored in the SW Pump House (SWPH), in the unused Unit 2 side which is a seismic, Category I building, protected from all hazards.
3.1.1.2.A Confirm that at least one connection point for each use of a PDDP is protected from a seismic event (includes access to the connection point and areas the operators have to access to deploy or control the PDDP).	The tie in points for the PDDPs will be to seismically qualified piping and free of any II/I concerns that could prevent access needed to deploy or operate the pump. **02/02/2015 Update:** The PDDP's are no longer being used in the NextEra Energy Seabrook strategies. NextEra Energy Seabrook will purchase a FLEX Low Pressure (LP) pump for use in the alternate coping strategies (without SEPS). The pump discharge primary connection is the EFW pump house (EFWPH), with an alternate connection to the main feed lines in the East and West pipe chases. All connection locations are located in seismic, Category I buildings, protected from all hazards.

3.1.1.2.B Confirm that a tow vehicle for FLEX equipment movement is reasonably protected from a seismic event, flooding event, and high wind event.	Multiple tow vehicles will be identified and stored and procedurally controlled above the flood level, away from adverse seismic interaction and secured against the 110 mph sustained design basis wind load. **02/02/2015 Update:** In addition to the multiple tow vehicles, a dedicated debris removal tractor will be stored in the FLEX storage building (SWPH). The SWPH is a seismic, Category I structure, protected from all hazards and the tractor can perform equipment towing duty in addition to debris removal.
3.1.1.3.A Procedural interface for seismic hazards -Confirm that operators have procedural guidance and references for the methods of obtaining local readings for critical parameters to support the implementation of the coping strategy, consistent with the guidelines in Section 3.2.1.10 of NEI 12-06.	FSGs are being developed to provide this guidance. **02/02/2015 Update:** The FSG's have strategies to restore AC power to vital battery chargers and ensure at least one train of critical parameters remain available. If the restoration of AC power via a battery charger is unsuccessful or if a seismic event adversely affects critical instrumentation, the procedures include strategies to obtain instrument readings at the Control Room (CR) cabinets or locally in the field at the containment penetrations. The readings for the 12 critical parameters identified on page 19 of the OIP can be obtained for both Train A and/or Train B critical parameters using hand-held battery powered meters.
3.1.1.4.A Off-Site Resources – Confirm the location of the local staging area for the RRC equipment, and that access routes to the site, the method of transportation, and the drop off area have been properly evaluated for all applicable hazards.	The local staging area will be in the General Office Building (GOB) parking area just off the South access road. This location is away from seismic interaction concerns and above the flood elevation. **02/02/2015 Update:** The GOB is the preferred site staging area and Parking Lot B is the alternate staging area. Engineering evaluation confirming the adequacy for each has been completed. Soil liquefaction studies will be completed to verify acceptability for each primary and alternate

	access route to be used.
3.1.5 High temperature – Confirm that the effects of high temperature have been considered in the procurement, protection, and deployment of FLEX equipment.	High temperature has been included in the design and storage of FLEX equipment. The SEPS generators and switchgear are located in environmental structures. At least one PDDP is located in a structure that protects against high temperature. Equipment designed to IEEE standards of 104 degrees F bound postulated high temperature conditions at the site. **02/02/2015 Update:** The PDDP's are no longer being used in the NextEra Energy Seabrook strategies. NextEra Energy Seabrook will purchase the following portable equipment for use in the alternate coping strategies (without SEPS): • FLEX Low Pressure Pump (FLLP) • FLEX High Pressure Pump (FLHP) • FLEX Submersible pump • 480V 250 KW Generator • Two 480V 30 KW Generators • Tow vehicle/debris removal tractor • Debris removal equipment • Refueling cart • Three Diesel powered light towers This equipment will be stored in the SWPH, in the unused Unit 2 side which is a seismic, Category I building, designed for 104 degrees F postulated high temperature conditions at the site.
3.2.1.7.A Confirm that portable FLEX equipment is included in the licensee's program to maintain equipment available for deployment in shutdown and refueling modes.	Portable FLEX equipment (including the SEPS gensets) will be maintained in shutdown and refueling modes. **02/02/2015 Update:** The Seabrook Technical Requirements (TR) for FLEX equipment will be applicable in all modes. The site outage risk management procedures will require equipment availability and in some cases, prestaging,

	based on specific outage risk windows.
3.2.1.9.A Use of portable pumps – Confirm that appropriate procedural guidance is provided for operation of the PDDPs for SG and RCS injection as part of the FLEX strategies.	The PDDP is capable of injection into the SGs after manual depressurization using the atmospheric dump valves. The injection path is into the main feedwater header to existing 2" drain lines located between the Feedwater Isolation Valves (FWIVs) and the main feedwater check valves. The existing guidance in the Station's Severe Accident Guidelines (SAG's) to depressurize the SG's and provide feedwater will be incorporated into the FSGs. The PDDP is capable of makeup to a depressurized SG. Per the vendor curve for the PDDP, the pump is capable of producing 225 psig TDH at a flow rate of 1000 gpm. Per the pump curves, both pumps can produce significantly greater than 1,000 gpm flow before they approach their runout limits. The 275 psig upper pressure limit used is a restriction based on the pressure rating of the temporary hoses and the capability of the PDDP's. The SAG will be modified for use as an FSG. Currently the Station's Severe Accident Guidelines (SAG's), provide procedural direction for use of the PDDP as an RCS makeup source, temporarily connecting either a high pressure suction source (defined as between 150 and 275 psig) or a low pressure suction source (defined as <150 psig) to the suction side of either a Charging or a Safety Injection pump. Seabrook is enhancing the FLEX strategy by including two Portable Diesel Driven High Pressure Makeup pumps (PDDHPs) that are capable of injection into the RCS. Procedural guidance to connect and inject into the charging pump discharge header at

	either the A charging pump or B charging pump 4" discharge piping located in the charging pump rooms[1] will be incorporated into the FSGs. The FSGs will use the new PDDHP, connecting the suction side of the pump to the Refueling Water Storage Tank (RWST) at an existing blank flanged connection in the PAB. The procedure will include steps to use the Reactor Makeup Water (RMW) tank, Boric Acid tanks, or Fire Water Main as alternate suction sources. The SAGs will be modified to use the new PDDHP as well. **02/02/2015 Update:** The PDDP's are no longer being used in the NextEra Energy Seabrook strategies. NextEra Energy Seabrook will purchase the following portable equipment for use in the alternate coping strategies (without SEPS): • FLEX Low Pressure pump (FLPP) • FLEX High Pressure pump (FHPP) The FSGs will direct the use of the FLPP for SG injection. The pump (325 gpm @ 400 psig) suction can be aligned to the CST, a seismic, Category I structure, with a dedicated volume protected from all hazards, or to the Unit 2 CW piping cistern, an underground holding tank which is seismic and missile protected. The pump discharge primary connection is the EFWPH, with an alternate connection to the main feed lines in the East and West pipe chases. All connection locations are located in seismic, Category I buildings, protected from all hazards. For Phase 3, the SAFER low pressure pump can be substituted for the FLPP using the same suction and discharge connection points. FSGs will also direct the use of the FHPP for RCS injection. The pump (15 gpm @ 2000 psig) suction can be aligned to Boric Acid Tank (BAT) A or B, located in the Primary Auxiliary Building (PAB), a seismic, Category I building, protected

[1] Preliminary, final location provided per EOC contract

	from all hazards. The pump has discharge primary & alternate connection points located in the protected PAB. For Phase 3, the SAFER high pressure pump can be connected at all suction and to a new connection in the discharge of the positive displacement charging pump.. Hydraulic analysis will be performed to verify required flow will be obtained for both the RCS and SG injection flow path and connections.
3.2.1.9.B Confirm availability of the fire main to provide a suction source for the PDDP for all of the hazards applicable to Seabrook.	The PDDP suction can be aligned to the fire main piping. The fire main will remain available for all hazards except for a seismic event. The source of water for the fire main at the fire pumps and tanks is not Seismic Class I and not protected from all hazards. Water inventory from this source that is protected from all hazards is therefore limited to the seismically qualified portions of the fire protection system. In the event of a seismic event, the FSGs will isolate this section of seismic fire main piping from the non-seismic portions to preserve the integrity of the seismic FP header. There is also a 6" cross-connect line (via FP-V761 and FP-V970) from the Service Water header to the FP header that can be used to supply additional water to FP in the event that the FP tanks and non-seismic FP piping is lost. In addition to the Fire Protection system, the Refueling Water Storage Tank is located within a Seismic Class I building and protected from all hazards. A suction path for the PDDP s and RCS makeup pumps will be developed as part of the Flex procedures to utilize this borated water source. Additional water sources include the Reactor Makeup Water Storage (RMW) Tank & Boric Acid Tanks, the Demin Water Storage Tanks and the Condensate Storage Tank. The FSGs for operation of the PDDP s and the RCS makeup pump

	will list the available connections and will prioritize the selection of available suction sources. **02/02/2015 Update:** The PDDP's are no longer being used in the NextEra Energy Seabrook strategies. Isolation and use of the seismic section of the fire main is not planned as a NextEra Energy Seabrook strategy due to the small usable volume in the associated piping. The FSGs will direct use of the FLPP for SG injection. The suction source for the FLPP is the seismic Category-1, flood and missile protected CST makeup volume. After CST depletion the FLPP suction source can be shifted to the Unit 2 CW piping cistern, a seismic/ missile protected holding tank that can provide additional SG makeup until 72 hours after the event, when RRC resources are available at the site. The FSGs contain alternate makeup strategies to use the non-seismic DWSTs and Fire Water Tanks if they remain available. The FSGs will also direct the use of the FHPP for RCS injection. The FHPP suction source can be aligned to BAT A or B, located in the PAB, a seismic, Category I building, protected from all hazards.
3.2.2.A Confirm that the PDDPs and hose trailers are incorporated into the FLEX guidelines for makeup and spray to the SFP.	The FLEX guidelines will not utilize the PDDPs for this purpose. The SFP is located below grade. The strategy for SFP makeup will use gravity drain from the RWST which is located inside a Class I structure protected from all hazards. **02/02/2015 Update:** The Refueling Water Storage Tank (RWST) remains the primary strategy for SFP makeup. The RWST is contained in a seismic Category1 structure that is also flood protected. The tank farm where these building are located is not designed with a missile protected building roof, but the tanks have an associated dike area qualified as seismic, Category I, to contain the entire contents of the tanks in the event of a tank rupture. The FSGs contain

	alternate strategies for SFP makeup using the FLPP from the credited Unit 2 CW piping cistern, a seismic/ missile protected holding tank that can provide additional SFP makeup for 72 hours. The FSGs include alternate strategies for non-protected SFP makeup sources from the DWSTs and Fire Water Tanks if they remain available.
3.2.4.4.A Confirm that adequate portable lighting is available for operator use during an ELAP event.	Portable lighting will not be needed if either SEPS genset is available. Portable battery powered lighting will be available for use during the ELAP event in the event both SEPS are inoperable. **02/02/2015 Update:** Additional diesel powered portable lighting towers will be stored in the SWPH, a seismic, Category I building protected from all hazards.
3.2.4.4.B The NRC staff has reviewed the licensee communications assessment (ADAMS Accession Nos. ML 12311A34 and ML 13060A048) and has determined that the assessment and planned upgrades are reasonable (ADAMS Accession No. ML 13102A254). Confirm that the upgrades have been completed.	Upgrades have been completed.
3.2.4.7.A Confirm the source of water to be used for makeup to the service water cooling basin tower by the portable diesel-driven cooling tower makeup pump.	The nearby brackish Brown's River is the source of water.
3.2.4.8.B Confirm that any SEPS missile barrier modifications do not interfere with the ability to remove snow from the SEPS DGs air intake system.	The barrier will be designed to facilitate snow removal from the intake system area. **02/02/2015 Update:** SEPS missile barriers will not be installed. SEPS remains NextEra Energy Seabrook's primary strategy during all events with the exception of a wind driven missile event. For that event, portable equipment (pumps, generators, and necessary support equipment) stored in a seismic, Category I structure, protected from all hazards, will be used to provide coping capability.

3.2.4.9.A Confirm that the refueling strategy for SEPS has been changed to require refueling to begin within 24 hours of the event.	The SEPS refueling plan in the original OIP uses a small tank (500 gallons) mounted on a trailer to transfer diesel fuel from the EDG storage tanks to the SEPS within 36 hours. However, in the event that only one SEPS is available post ELAP, refueling will be required after 24 hours. Accordingly the refueling requirement for SEPS has been revised to 24 hours. The trailer and associated hoses will be stored in the Class I SW pump house. The refueling strategy will provide the 178 gal per hour needed to refuel the SEPS engines with in the required 24 hours. **02/02/2015 Update:** A 1000 gallon refueling trailer will be stored in the SWPH. The FSGs will perform debris removal and deployment of the trailer and will provide guidance to refuel the SEPS engines in less than 24 hours.
3.3.1.A Confirm that the PDDPs will be included in the maintenance and testing (M&T) program in conformance with the Electric Power Research Institute report on M&T.	The PDDPs will be incorporated into the maintenance and testing program consistent with EPRI guidance. **02/02/2015 Update:** The PDDP's are no longer being used in the NextEra Energy Seabrook strategies. NextEra Energy Seabrook will purchase the following portable equipment for use in the alternate coping strategies (without SEPS): • FLEX Low Pressure Pump (FLPP) • FLEX High Pressure Pump (FLHP) • FLEX Submersible pump • 480V 250 KW Generator • Two 480V 30 KW Generators • Tow vehicle/debris removal tractor • Debris removal equipment • Refueling cart • Three Diesel powered light towers This equipment will be incorporated into the FLEX maintenance and testing program consistent with the Fleet PM program guidance, based on current EPRI recommendations

3.3.2.A Confirm that the configuration control of FLEX strategies conforms to the guidance of Section 11.8 of NEI 12-06.	Configuration control for the FSGs will conform to the guidance of Section 11.8 of NEI 12-06.
3.4.A Offsite resources - Confirm that NEI 12-06, Section 12.2 guidelines 2 through 10, regarding minimum capabilities for offsite resources, have been adequately addressed.	The staffing analysis will confirm that NEI-12-06, Section 12.2 guidelines 2 through 10, regarding minimum capabilities for offsite resources, have been adequately addressed. **02/02/2015 Update:** The National SAFER response Center (NSRC) is in place and the NextEra Energy Seabrook contracts are written to ensure offsite resources are available for an ELAP event.

Attachment 2 to SBK-L-15025

Seabrook Station

Revised

FLEX Integrated Plan Document

SEABROOK
Revised
FLEX
INTEGRATED
PLAN
DOCUMENT

SEABROOK
POWER STATION
UNIT 1

Contents

SEABROOK STATION FLEX FINAL INTEGRATED PLAN DOCUMENT

1. Introduction

In 2011, an earthquake-induced tsunami caused Beyond-Design-Basis (BDB) flooding at the Fukushima Daiichi 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 (AC) 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 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 4.4] 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).

2. Regulatory Evaluation

2.1. Order EA-12-049 [Ref 4.6]

Based on NTTF Recommendation 4.2, the NRC issued Order EA-12-049 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 and have adequate capacity to address challenges to core cooling, containment and Spent Fuel Pool (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 required licensees of operating reactors to submit an overall integrated plan, 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 overall integrated plan or December 31, 2016, whichever comes first. For Seabrook this is November 15, 2015.

2.2. Order EA-12-051[Ref 4.6]

NRC Order EA-12-051 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.

NEI 12-02 provided guidance for compliance with Order EA-12-051. The NRC determined that, with the exceptions and clarifications provided in JLD-ISG-2012-03 [Ref 4.7], conformance with the guidance in NEI 12-02 is an acceptable method for satisfying the requirements in Order EA-12-051.

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 will address an extended loss of all AC power (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 of access to the 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).

Seabrook Station (SBK) is a 4-loop Westinghouse Pressurized Water Reactor located on the New Hampshire seacoast. The SBK FLEX 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 diesel generator sets known as the supplemental emergency power system (SEPS), not credited in the blackout analysis, provide rapid re-powering of an emergency bus. The installed Seismic Category I cooling tower is then able to provide an alternate Ultimate Heat Sink (UHS). The cooling tower is protected from seismic, flooding and severe weather events but is not protected for all wind driven missiles. The SEPS is protected against flooding and severe weather; is not protected from hurricane/tornado missiles; and is being modified to harden it for seismic events [Pending Action 13]. The SEPS and the cooling tower together provide an optimum response for seismic events or any event that does not result in a loss of the SEPS or cooling tower (e.g., due to a wind generated missile).

The portable FLEX equipment for the backup strategies is stored in an existing Seismic Category I structure located above the maximum Design Basis flood elevation and protected from all external hazards. The portable FLEX equipment consists of:

- FLEX Low Pressure Pump (FLLP)
- FLEX High Pressure Pump (FLHP)
- The existing portable cooling tower makeup pump
- FLEX Submersible pump
- 480 V 250 KW Generator
- Two 480V 30 KW Generators
- Powered self-propelled trailer mover (tugger)

- Tow vehicle/debris removal tractor
- Debris removal equipment
- Refueling cart
- FLEX hoses, cabling and connections

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.

The duration of each phase 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/Cooling Tower results in a rapid transition to Phase 2 with the restoration of an emergency A/C bus.

The strategies described below are capable of mitigating an ELAP/LUHS resulting from a BDB external 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 SBK emergency operating procedures 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 (MSSVs) and the addition of a corresponding amount of feedwater to the (SGs) via the turbine driven Emergency Feedwater (TDEFW) pump. A motor driven EFW pump will also be available, with SEPS operating, as soon as SEPS repowers an emergency bus. Backup is provided by the FLPP 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 Reactor Coolant System (RCS) cooldown will be completed prior to depletion of the CST inventory.

DC bus load shedding will ensure battery life is extended to at least 12 hours. [Ref 4.13] 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 in Mode 3 or Mode 4 in accordance with severe weather condition procedures.

In accordance with the event assumptions contained in NEI 12-06, neither Emergency Diesel Generator (EDG) 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 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 will develop to provide core cooling and the TDEFW pump will provide flow from the CST to the SGs to make-up for steam release.

SEPS and Cooling Tower Available

Both of the SEPS generators are assumed to start automatically as designed and run in standby until manually connected to an emergency bus. Only one of two SEPS generator sets (gensets) is required to repower an emergency bus. If necessary, the SEPS gensets can also be started manually from the digital control panel in the 'B' Essential Switchgear Room or locally from the digital control panels in each genset enclosure in accordance with ECA 0.0, Loss of All AC Power. As directed by ECA-0.0, the operating crew will manually close the SEPS breaker to 4.16 kV emergency Bus E6 ('B' Train vital power) from the Control Room, or locally in the 'B' Train Essential Switchgear Room. This action re-powers Bus E6 to supply 'B' Train ELAP loads. If Bus E6 is unavailable SEPS can be manually aligned and connected to emergency Bus E5 ('A' Train vital power). The electrical output of both SEPS gensets connects through a common switchgear to either the A or B emergency bus.

Once a 4.16 KV emergency bus is energized, operators verify that a centrifugal charging pump (CCP), a thermal barrier cooling water (TBCW) pump, a primary component cooling water (PCCW) pump, the motor-driven EFW (MDEFW) pump, and an ocean Service Water (SW) pump or a Cooling Tower (CT) pump are started by the Emergency

Power Sequencer (EPS). The operating crew will then shut down the MDEFW if the TDEFW is verified running. Operation of a CCP and a TBCW pump ensures adequate Reactor Coolant Pump (RCP) seal cooling throughout the event. 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.

The operating crew will 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. SEPS ELAP loads include the following:

- Service Water Cooling Tower Pump - 609 KW
- Primary Component Cooling Water Pump - 576 KW ('B' Train), 549 KW ('A' Train)
- Centrifugal Charging Pump - 554 KW
- Residual Heat Removal Pump - 343 KW (when in shutdown cooling)
- Spent Fuel Pool Cooling Pump - 17 KW
- Thermal Barrier Cooling Water Pump - 18 KW
- Vital 480 VAC Unit Substations that provide power to the vital battery chargers, vital instrumentation inverters, and control room lighting and ventilation - approximately 300 KW.

The Operating crew will make a determination within 2 hours whether or not the emergency AC busses can be returned within the Station Blackout (SBO) coping time of 4 hours. If it is determined that the AC buses will not be returned in 4 hours, then an ELAP will be declared and a transition made to the FLEX Support Guidelines (FSGs). Transition to Residual Heat Removal (RHR) cooling will proceed in Phase 2 with the SEPS/Cooling Tower available.

SEPS and Cooling Tower Assumed to be Lost as a Result of Wind Driven (tornado/hurricane) Missiles

In the event that the primary strategy is not available (e.g., SEPS and/or Cooling Tower are lost as a result of wind driven missiles), Phase 1 coping will rely on the TDEFW pump which automatically actuates to provide EFW flow to all four SGs with water from the CST. The EFW Flow Control Valves (FCVs) will be in an open configuration allowing EFW flow to all SGs. If these AC powered EFW FCVs do not have power they can be manually controlled locally. RCS heat sink will be maintained in the Phase 1 coping period by feeding the SGs using the TDEFW pump while steaming to the atmosphere via the ASDVs on each main steam line.

Presently the protected CST volume is adequate for 8 hours of heat removal. Analysis is being performed to extend the CST coping period [Ref 4.10] [Pending Action 36]. Station batteries are adequate for coping at least 12 hours with load reduction within 2 hours of event initiation. No RCS makeup is required for Phase 1 after installation of the Westinghouse SHIELD low leakage RCP seals. [Pending Action 21]

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 Cat I structure, can be used to stroke the valves a minimum of ten times. The ASDVs can also be manually operated via a manual actuator.

Feedwater supply for the TDEFW pump is from the Seismic Category 1, CST.

RCS: RCS cooldown will be initiated 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 250 psig.

Electrical/Instrumentation: Load shedding of non-essential loads will be completed approximately 2 hours after the ELAP/LUHS event initiation. This action, along with DC bus cross-tying, results in a coping time of 12 hours.

3.2.2. Phase 2 Strategy

SEPS and Cooling Tower Available

The SBK Phase 2 coping response with SEPS and Cooling Tower available begins when an emergency 4.16 KV bus is re-powered from SEPS (Bus E6 preferred). RCS heat sink will be maintained by feeding the SGs 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. The RCS will be cooled down 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) which provides 7000 ppm boric acid to the charging pump suction. CS-V426 is powered from a "B" Train motor control center therefore it can be operated from the control room with SEPS powering Bus E6. If necessary, this valve can also be opened locally by a field operator in the Boric Acid Storage Tank room. An alternate available borated water source is the Refueling Water Storage Tank (RWST) which can be aligned to the charging pump suction. If a rapid boration is not available, the charging pump suction will draw borated water from the RWST.

A cool down to Cold Shutdown ensures that the 'B' Train RHR system can be placed in operation prior to expending available water volume in the CST. The PCCW system provides cooling water to safety related equipment, including the RHR pump and RHR heat exchanger. The PCCW system also provides cooling water flow to the SFP heat exchanger in the Fuel Storage Building (FSB) and the RCP Thermal Barrier cooling loop located inside the Containment Building. The PCCW heat exchanger is provided with cooling water flow from the Service Water (SW) system via the 'B' Train Cooling Tower pump. 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. The safety-related nitrogen backup supply is sized to provide 10 full cycles of the temperature control and bypass valves over a 6 hour period. If necessary, these valves can also be operated locally in the Primary Auxiliary Building (PAB) by a field operator.

The RCS will be cooled down and de-pressurized to a point where the RHR system can be placed in service (RCS temperature less than 350°F and RCS pressure less than 360 psig). The NEI 12-06 assumption of the loss of normal access to the UHS means that the ocean SW pumps are assumed to be unavailable for the duration of the event. Consequently, SBK will rely on the SW Cooling Tower as a backup UHS. The heat sink will be restored by ensuring the 'B' Cooling Tower pump is running after the emergency AC bus is re-energized to restore flow in the 'B' Train SW system. This action can also be accomplished by manual actuation of a Tower Actuation Signal (TAS) from the Control Room. 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.

It is anticipated that the operating crew will evaluate refueling strategies for the SEPS gensets relatively early in the event. The refueling strategy implementation should commence within 24 hours to allow adequate time for strategy implementation.

<u>SEPS and Cooling Tower Assumed to be Lost as a Result of Wind Driven Missiles</u>

NEI 12-06 Section 3.2.2 requires that "Regardless of installed coping capability, all plants will include the ability to use portable pumps to provide RPV/RCS/SG makeup as a means to provide a diverse capability beyond installed equipment." At SBK this will be accomplished by the portable FLPP and FLHP stored in a Seismic Category 1 structure.

In the event that the SEPS and/or Cooling Tower are lost (e.g., as a result of wind driven missiles), the Phase 2 strategy will utilize the portable FLEX equipment and continue to depressurize the SG to 250 psig. The FLPP will be able to pump from either the backup water sources or the CST to the EFW header. An alternate discharge path is via the main feed water header. The alternate water sources will include at least one source protected against all hazards with 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.

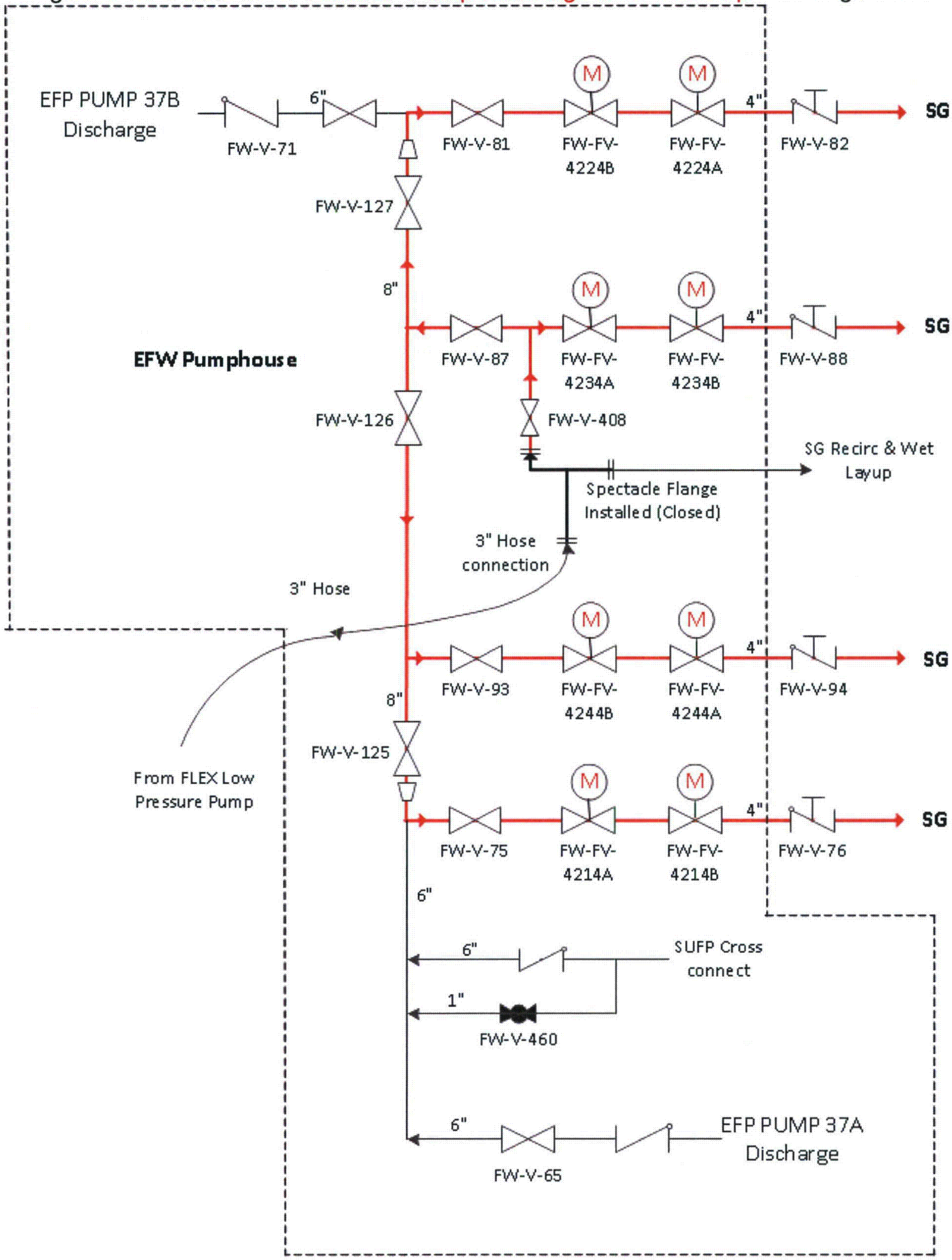
Load shedding of the DC busses will be followed by connecting a 250 KW 480 V FLEX generator to a portable battery charger for battery charging, DC control power and instrumentation. Backup instrumentation readings can also be accessed locally at the containment penetration if required. RCS makeup should not be required for the Phase 2 duration. However the FLHP is available to provide injection from the Boric Acid Tanks (BAT). The Westinghouse SHIELD low leakage seals will be installed in the fall 2015 refueling outage ensuring that RCS Inventory is adequate for a minimum of 7 days. RCS boration will be required within Phase 2 and is accomplished with the FLHP taking suction on the BAT. The timing of required boration is being evaluated by Westinghouse [Pending Action 29].

SFP makeup will be provided by gravity drain from the RWST or using a portable FLEX submersible pump. The alternate makeup strategy uses the FLEX submersible pump and water from the Unit 2 Circulating Water (CW) cistern (below grade and protected from all hazards) pumped directly into the SFP.

RCS core cooling and heat removal will be maintained while performing a cooldown and depressurization of the RCS. At 250 psig SG secondary pressure, the ASDVs are throttled to stabilize SG pressure and prevent adverse impact to the TDEFW pump operation and safety injection accumulator nitrogen injection. The initial cool down is with the TDEFW pump using the CST as a water source. The FLPP will be deployed for CST fill and/or injection into the SGs prior to depletion of the CST or in the event that the TDEFW pump fails.

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 the battery chargers. Manual load shedding will increase the duration of the battery powered control and instrumentation monitoring functions to approximately 12 hours.

Figure 1 Connections for FLEX LP Pump Discharge to EFW Pump Discharge Lines



3.2.3. Phase 3 Strategy

SEPS and Cooling Tower Available

In this scenario the National SAFER Response Center (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 Cooling Tower as a backup UHS.

SEPS and Cooling Tower Assumed to be Lost as a Result of Wind Driven Missiles

The plant will be able to cope using portable FLEX equipment to maintain SG cooling until at least 72 hours after the ELAP. After 72 hours the NSRC is assumed to supply two 1MW 4160V generators which can be connected to emergency bus E5 (Train A) or emergency bus E6 (Train B) via the corresponding SEPS supply breaker to energize AC loads required to maintain safe shutdown and core cooling indefinitely . An additional 1 MW 480 V generator and additional pumps, hose and connections are also supplied. The NSRC low pressure high flow (LPHF) pump and submersible booster pump will be used to restore the UHS. The submersible pump heads will be placed in the SW forebay, located inside the Seismic Category I SW pump house, 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. With SW cooling restored, the plant can then be placed on shutdown cooling using the repowered RHR pump and PCCW pump.

Phase 3 strategies for all modes of RCS cooling will be to establish Shutdown Cooling (SDC) which will require cooling the PCCW Heat Exchanger that in turn cools the RHR Heat Exchanger [Pending Action 24]. The NSRC 4160 V AC generators will re-power several loads in support of SDC. One RHR pump will be re-powered to establish RCS recirculation. Heat removal will be through the RHR heat exchangers which are cooled by establishing flow through the PCCW system by re-powering one of the PCCW pumps.

Temporary power cables will be supplied with the NSRC 4.16kV and 480 V generators for connection to the Class 1E Buses using the primary or alternate connections.

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, Cooling Tower 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 SGs following an ELAP / LUHS event. Two air operated valves supply steam to the TDEFW pump turbine from each of the A and B main steam lines with 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 SG level, safety injection signal, loss of off-site power, 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 located in a safety structure designed for protection from applicable design basis external events.

- 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 a minimum of 10 cycles of each valve after loss of control air. 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.

- Batteries

The safety related batteries and associated DC distribution systems are located within safety related structures designed to meet applicable design basis external hazards and will be used to initially power required essential instrumentation and applicable DC control components. Load shedding of non-essential equipment and cross tying the batteries prior to 2 hours after the start of the ELAP event provides a service time greater than 12 hours per calculation SBC-227,-CALC, Rev. 05.

- Electrical Analyses

The Class 1E total battery duty cycle was calculated in accordance with the IEEE-485 methodology using manufacturer discharge test data. The calculated battery duration for the backup FLEX strategy with SEPS unavailable is greater than 12 hours assuming load shedding and cross tying the batteries is accomplished in the first 2 hours.

The strategy to re-power the batteries is to connect the FLEX 480 VAC 250KW portable diesel generator to the existing portable battery charger connection.

Additional 480 VAC and 4.16kV combustion turbine powered generators are available from the NSRC for the Phase 3 strategy.

- Condensate Storage Tank (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 surrounded by a seismic Cat 1 concrete enclosure designed to contain the minimum Technical Specification water volume of 212,000 gallons which is adequate for a minimum of 8 hours of SG cooling. Analysis is being performed to extend the CST coping period [Ref 4.10] [Pending Action 36].

- FLEX LP Pump Discharge Connection

The primary FLLP discharge connection for SG injection is on the EFW discharge line (Figure1) located within a Category I building. The alternate connection is on the main feed header in both steam and feed pipe chases.

- FLEX LP Pump Suction Connections

Suction connections for the FLLP utilize suction hose connections to each of the water sources listed in Table 1. The connection includes a hose coupling suitable for easy connection of a hose supplying water from the FLLP that draws from one of multiple sources of water (Refer to Table 1).

- FLEX HP Pump Discharge Connections

  The primary connection for the discharge of the FLHP into the RCS is a permanently installed hose connection to the positive displacement (PDP) charging pump discharge piping. The alternate discharge is on the Safety Injection discharge header.

- FLEX HP Pump Suction Connections

The connection for the suction of the FLHP is at the BAT. A permanent hose connection will be installed. The backup suction source will be from the RWST which will also have a permanent connection [Pending Action 35].

- Electrical Connections

  - 480 V Connection

  The primary/alternate connections for the FLEX 480V generator are the existing Train A and B portable battery charger connections.

  - 4160V Connection

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

Rank	Volume (gal)	Source	Seismic protected	Missile protected	Water Quality
1	212,000	CST	Y	Y	Demin
1	750,000 total	Demin Water Storage Tanks	N	N	Demin
2	1,000,000 total	Fire Water Tanks	N	N	Potable
3	850,000	Unit 2 Circulating Water Pipe Cistern	Y	Y	Potable

Table 1 – Water Sources for FLPP

3.2.4.1.2. Plant Instrumentation

One train of safety-related vital instrumentation will be powered from SEPS. This will provide the operators with the necessary instrumentation to monitor critical plant parameters. This instrumentation includes the following:

- 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 Narrow Range and Wide Range Level
- Condensate Storage Tank Level
- Containment Wide Range Pressure
- Spent Fuel Pool Level (including new wide range level indication per NRC Order EA-12-051)
- Emergency Feedwater Flow

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.

If SEPS is unavailable, the portable FLEX 480 V generator will be used to repower 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 both SEPS and the FLEX 480 V generator are unable to restore vital instrumentation an additional backup option in the FSGs directs actions to obtain vital instrument readings from the Control Room cabinets or locally at the containment penetrations.

3.2.4.2. Thermal-Hydraulic Analyses

3.2.4.2.1. Secondary Analysis

Thermal Hydraulic calculations are being performed to determine the inventory required to maintain steam generator levels and times associated with the volumes [Pending Action 30]. The analysis will provide the duration that the existing CST usable volume can be credited and the time at which another source of water is required [Pending Action 36]. If the SEPS/Cooling Tower 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 1. The below grade Unit 2 CW piping cistern is protected from all hazards and is constructed using below ground piping from the abandoned Unit 2 CW system. This provides a clean water source sufficient for at least 72 hours into the ELAP/LUHS event.

3.2.4.2.2. Reactor Coolant System Analysis

The Pressurized Water Reactor Owner's Group (PWROG) document WCAP-17601[Ref 4.23] is used as the basis for generic guidance relative to RCS inventory and boration strategies. SBK will perform a site specific analysis following the methodology provided in the PWROG guidance to determine RCS coolant make-up rates and boric acid concentrations needed to keep the reactor subcritical [Pending Action 29].

3.2.4.3. Reactor Coolant Pump Seals

SBK is a Westinghouse plant that is installing Westinghouse SHIELD Passive Thermal Shutdown Seals [Pending Action 21]. As demonstrated by testing documented in TR-FSE-14-1-P Revision 1, the RCP seal leakage associated with the loss of seal component cooling water is under 1 gpm per seal. The conditions of ML 14132A128 [NRC Endorsement of Westinghouse TR-FSE-14-1-P Revision 1 With Conditions] are met by this design. For the SBK 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 (SDM) Analysis is being performed to verify that the reactivity SDM of at least 1% (Keff<0.99) is available through the initial cooldown period to 250 psig SG pressure [Pending Action 29]. 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 borated water from the BAT or borated water from the RWST will be adequate to meet shutdown reactivity requirements at the limiting conditions.

3.2.4.5. Flex Pumps and Water Supplies

3.2.4.5.1. FLEX LP Pumps

Consistent with NEI 12-06, Appendix D, the emergency feedwater injection capability is provided using a portable FLLP through a primary or alternate connection. The FLLP is a 325 gpm (@400 psig) pump. The FLLP is a trailer-mounted, diesel engine driven centrifugal pump that is stored in the SWPH. The portable, diesel-driven FLLP will provide a SG injection method when the TDEFW pump can no longer perform its function. Hydraulic analyses has confirmed that the FLLP is sized to provide the minimum required SG injection flow rate to support reactor core cooling and decay heat removal [Pending Action 30].

3.2.4.5.2. LP FLEX Pump Water Sources

- Condensate Storage Tank

The CST provides sufficient inventory to meet Phase 1 requirements. In the primary strategy with the SEPS/Cooling Tower available, the operators will be able to transition to RHR prior to exhausting the CST volume. In the backup strategy, the portable FLLP can take suction from several additional water sources, including the CST, to feed the SGs.

- Additional Water Sources

The various sources on site that are accessed to supply the FLLP are shown in Table 1 with their respective capacity and water quality. The order in which the sources are tapped is based on actual availability in the event and water quality. The Tanks listed in Table 1, Water Sources for LP FLEX Pump, have FLEX connections that will allow hoses to be run to the FLLP in an expeditious manner.

Available sources that supply higher quality water to inject into the SGs are designated to be accessed first.

3.2.4.5.3. FLEX HP Pump Borated Water Sources

Two sources of borated water have been evaluated for use during a BDBEE. Each borated water source is discussed below, in order of preference.

Boric Acid Tank (BATs): In the event that the RWST is unavailable or becomes depleted, two seismically qualified, missile protected BATs are available to provide a suction source for the repowered charging pump (SEPS available) or FLHP to inject borated water into the RCS. These tanks are maintained greater than 18,000 gallons each at 7,000 ppm boron. The BATs are the preferred borated water source for the RCS injection strategies.

Refueling Water Storage Tank (RWST): The tank is a safety-related, seismically qualified storage tank, located within a seismic building, but is not qualified for vertical missile protection through the roof. The borated volume is maintained greater than 479,000 gallons at a minimum boron concentration of 2400 ppm.

Figure 2 CST Connection

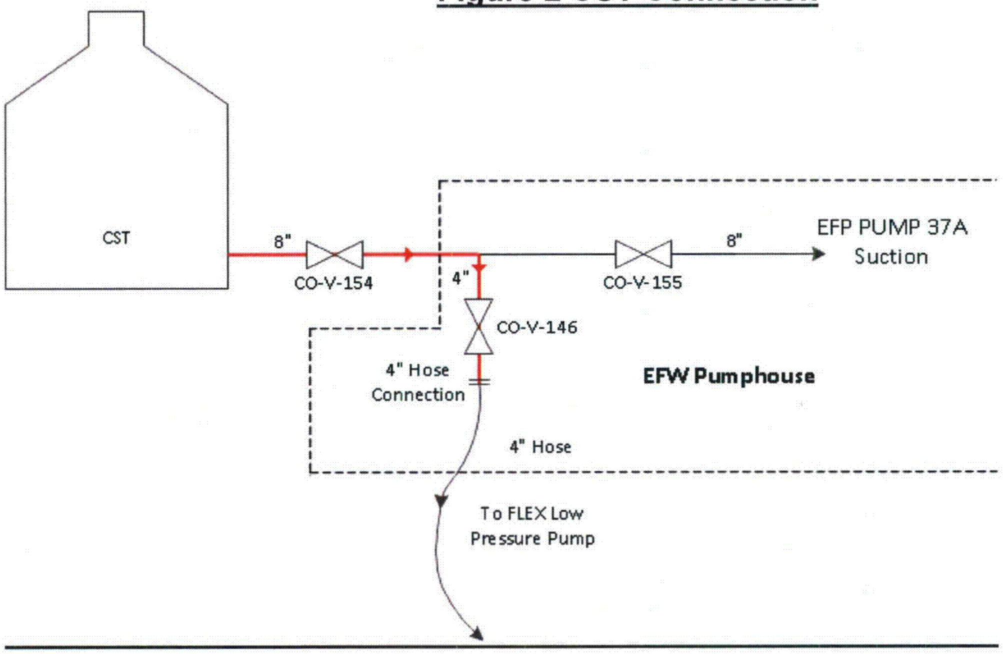


Figure 3
Connections for FLEX HP Pump Discharge Primary Connection

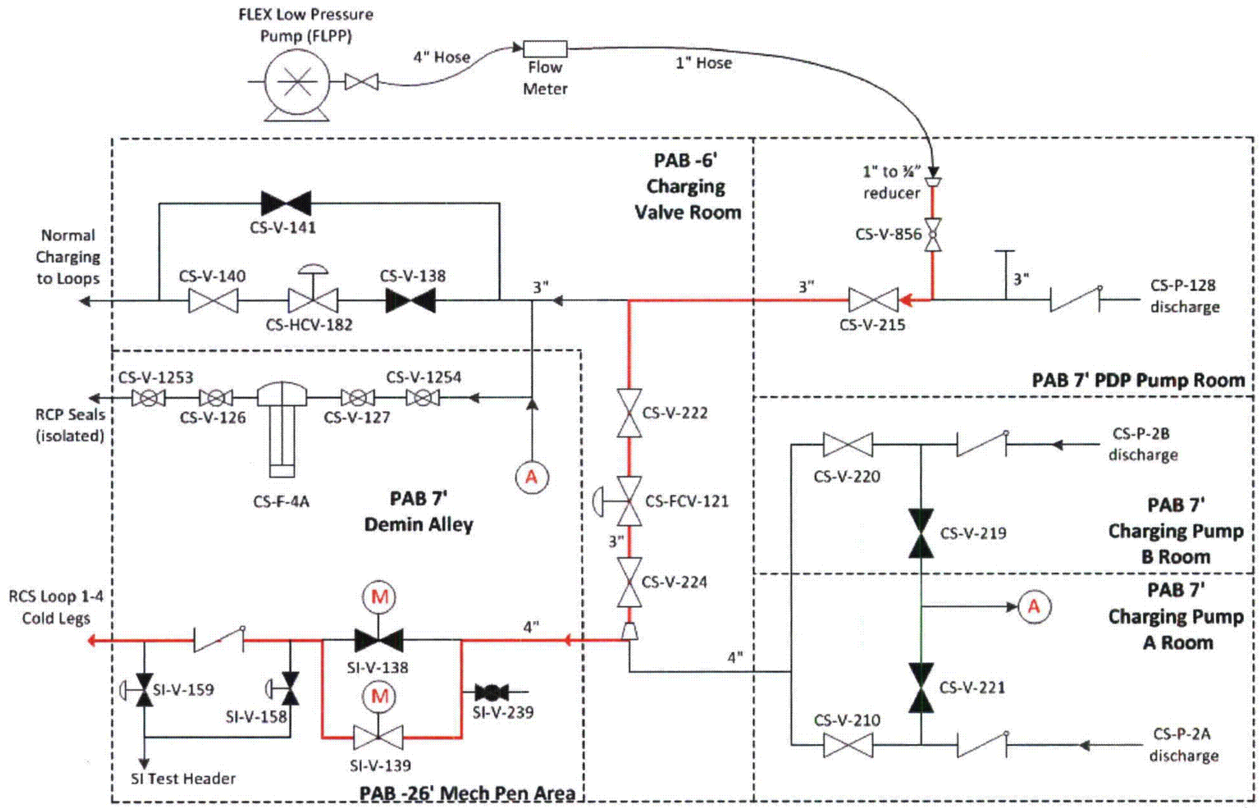


Figure 4
Connections for FLEX HP Pump Discharge Alternate Connection

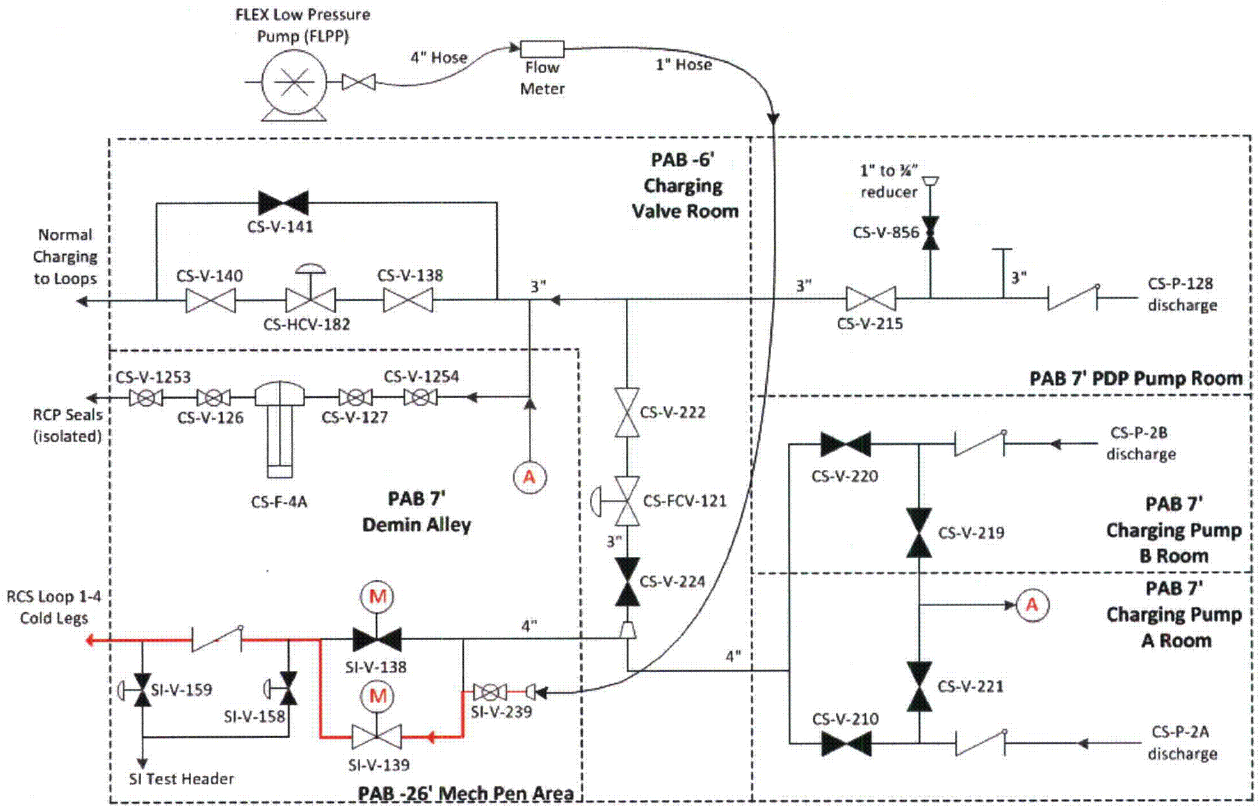
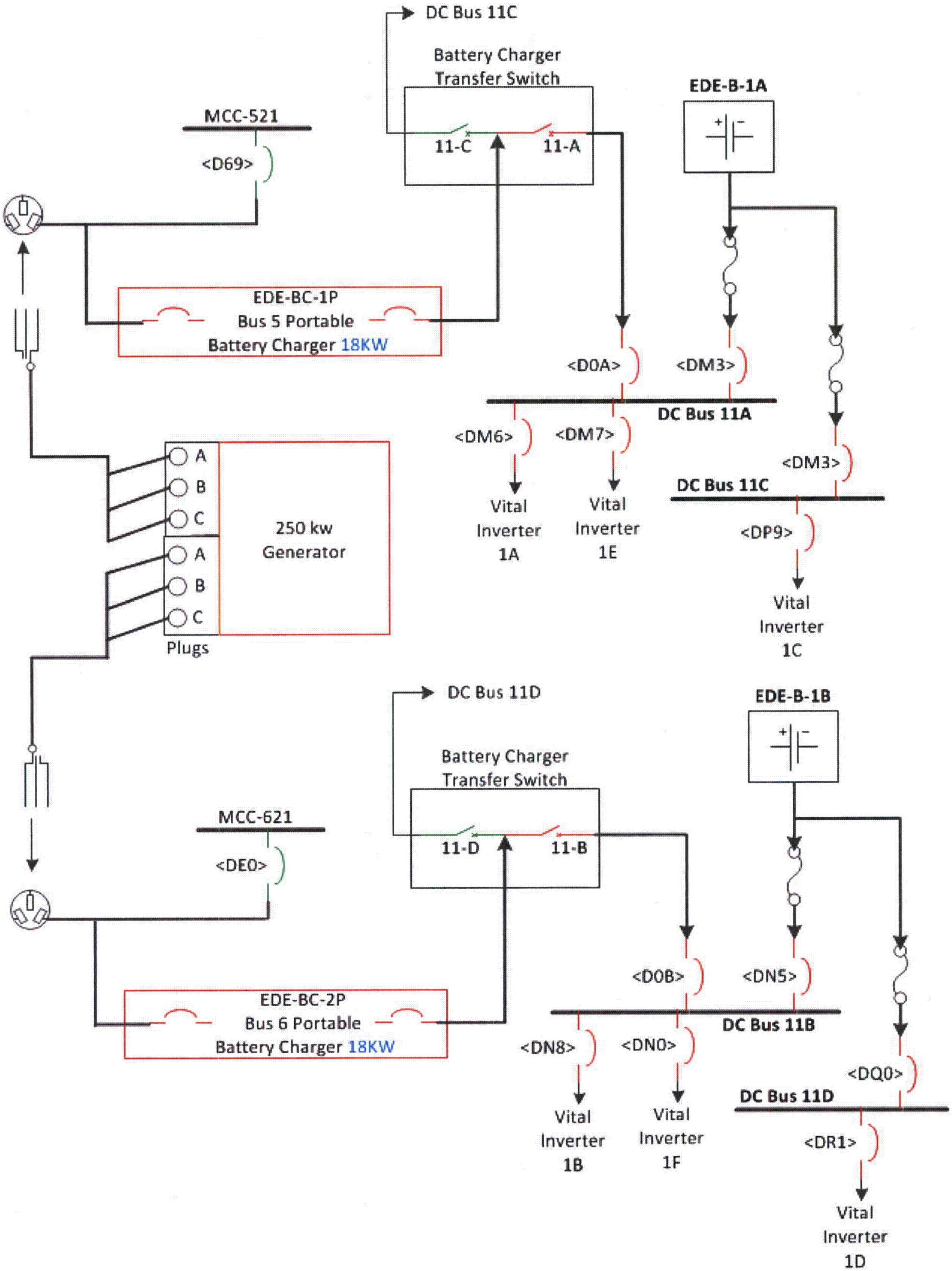


Figure 5
Train A and Train B Portable Battery Connection



3.3. Spent Fuel Cooling Strategies

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

3.3.1. Phase 1 Strategy

Reestablish SFP cooling if SEPS is available. If SEPS is not available, then monitor spent fuel pool level using instrumentation installed as required by NRC Order EA-12-051.

3.3.2. Phase 2 Strategy

If SEPS and consequently SFP cooling are not available, then the Phase 2 strategies would be to initiate makeup using the hard pipe connections 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.

3.3.3. Phase 3 Strategy

Phase 3 strategies are to continue or establish the SFP cooling and makeup strategy indefinitely.

3.3.4. Spent Fuel Pool 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 1 structures. This is an existing, proceduralized process that requires no FLEX equipment or AC or DC power to accomplish.

- Alternate Makeup

The FLEX Submersible Pump can be deployed using water from the Unit 2 CW cistern pumped directly into the SFP. The FLEX submersible pump and its suction hoses and fittings plus its discharge hoses and fittings are deployed from the SWPH.

- SFP Ventilation

Ventilation requirements to prevent excessive steam accumulation in the FSB 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. 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 Spent Fuel Pool Level Instrumentation.*

3.3.4.2. Thermal-Hydraulic Analyses

An analysis will be performed to determine the timing and makeup requirements for the SFP [Pending Action 30].

3.3.4.3. Water Sources

3.3.4.3.1. Water Supplies

The preferred source for SFP is the RWST with a backup from the Unit 2 CW piping cistern.

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.

3.4. Containment Function Strategies

With an 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 several weeks of a BDBEE ELAP event [Ref 4.17]. Therefore, actions to reduce containment temperature and pressure and 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. For scenarios with SGs 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 opening the personnel hatch. 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 72 hours [Pending Action 27]. 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/Cooling Tower were available, one train of containment cooling would be available in Phase 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 from the NSRC. Mobile 4kV combustion turbine generators will be brought in from the NSRC in order to supply power to either of the emergency buses via the SEPS breaker. 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

For Modes 5 and 6 without SGs, FSG-14 establishes a containment ventilation strategy that utilizes the installed Personnel Hatch to ventilate containment.

3.4.4.1.2. Containment Strategy Instrumentation

Containment pressure indication is available in the Control Room or locally at the penetration throughout the event.

3.4.4.2. Thermal-Hydraulic Analyses

Containment temperature and pressure will remain below containment design limits assuming a 1 GPM per RCP seal leakage and a 1 GPM unidentified leak rate [Ref 4.17] [Pending Action 27]. In addition, essential instruments subject to the containment environment will remain functional for a minimum of seven days.

3.4.4.3. FLEX Pumps and Water Sources

In the case of the SEPS/Cooling Tower unavailable, the NSRC low pressure high flow (LPHF) pump and submersible booster pump will be used to restore the UHS. The submersible pump heads will be 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 via SEPS or equipment being supplied from the NSRC. The 4.16KV and 480V generators are adequate for the Phase 3 loads [Ref 4.15].

3.5. Characterization of External Hazards

SBK is a 4-loop Westinghouse Pressurized Water Reactor located on the New Hampshire seacoast at 70 degrees, 51 minutes, 05 seconds west longitude; 42 degrees, 53 minutes, 53 seconds north latitude.

SBK '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 current licensing basis (CLB) for Seismic Category I (SC-1) equipment at SBK is defined in Updated Final Safety Analysis Report (UFSAR), Section 3.7(B). Site design ground motion response spectra 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 (RG) 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 RG 1.61, 'Damping Values for Seismic Design of Nuclear Power Plants.'

As defined in UFSAR Section 2.5, 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 [Ref 4.2].

3.5.2. Flooding

The CLB for Flood Protection for SBK includes the ability to withstand the effects of a combined Standard Project Storm (SPS) and Probable Maximum Hurricane (PMH). It also must consider 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 Mean Sea Level (MSL) on the east and south walls of specific site buildings for a short duration of approximately 1-2 hours [Ref 4.2].

3.5.3. High Wind Event

Seabrook is a coastal site and is subject to high wind hazards. SBK 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 SBK UFSAR Chapter 3, Section 3.3, 'Wind and Tornado Loadings'. Per UFSAR Section 3.3.1.1, the design wind velocity is 110 mph. Wind loads are applied to all seismic Class 1 structures based on this design wind speed. UFSAR Section 3.3.2 states that the design tornado has a maximum wind velocity of 360 mph (horizontal rotational wind speed of 290 mph plus translational speed of 70 mph). The design tornado applied to SBK is conservative as NUREG/CR-4461 Rev. 2, Table 6-1, on which NEI 12-06 Figure 7-2 is based, lists SBK possible tornado wind speeds from 143 mph to 254 mph depending on the probability level used. Additionally, tornados in coastal New England are extremely rare and of much lower severity than assumed in the UFSAR.

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

The SEPS and Cooling Tower 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 Cooling Tower is a seismically designed reinforced concrete structure that was not evaluated for missile impact. It also has building openings that make it potentially vulnerable to vertical and oblique trajectory missiles.

The Unit 2 CW cistern is below grade and will be provided with an access missile shield. The shield will provide protection from the full spectrum of UFSAR missiles, but will be based on a tornado wind speed of 200 mph and hurricane gust of 180 mph. These wind speed values differ from the UFSAR design, but are consistent with the current guidance found in the applicable RGs for maximum wind gusts. Specifically, a tornado wind speed of 200 mph is shown in RG 1.76 Figure 1 for Region II. The peak hurricane wind gust for the SBK location shown on Figure 3 of RG 1.221 is 180 mph. The corresponding missile velocities will be calculated consistent with the UFSAR missile spectrum.

3.5.4. Snow, Ice and Extreme Cold

SBK 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 2.3.1 notes that the SBK 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. SBK structures are designed for snow and ice loads.

3.5.5. Extreme Heat

SBK '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.
- SBK 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 SBK 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 minus 32°F. The road to the SEPS gensets is included in the site snow and ice response plan. Clearing snow around the SEPS gensets themselves will be added to the site snow and ice response plan to ensure the engine air intake system is clear of snow and ice [Pending Action 16] The portable FLEX equipment is stored within the protected area in the SWPH unused Unit 2 bays. The SWPH is capable of housing all the portable FLEX equipment required to meet FLEX strategies. The SWPH is designed to survive design basis hurricanes, tornadoes and tornado missiles. The existing entrance is being modified with a new Barrier I missile door to allow for rapid deployment with missile protection. [Pending Action 39]

During a BDB flooding or hurricane event, access to areas in the plant could be restricted due to flood waters and high winds. SBK 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 [pending Action 33]. The strategy to maintain core cooling was developed such that access to Phase 2 FLEX equipment and access to 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.) shall be capable of operating in hot weather in excess of the site extreme maximum of 100.9°F which is below the threshold of 110° F discussed in NEI 12-06. It is not expected that FLEX equipment and deployment would be affected by high temperatures. Nonetheless, temperature considerations will be made with respect to procuring and maintaining equipment within design ratings and for personnel habitability. Storage of FLEX equipment in the SWPH will maintain temperatures within the manufacturer's recommendations.

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.

Seabrook will implement a FLEX program document stipulating the required administrative controls for FLEX equipment.

Existing plant configuration control procedures will be 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. This will be outlined in the program document.

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 4 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. Debris removal equipment is stored inside the SWPH protected from the all hazards such that the equipment remains functional and deployable to clear obstructions to the deployment location(s). 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. For this reason, certain barriers (gates and doors) will be opened and remain open. This deviation of 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 cables/hoses 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 Physical Security Plan (PSP). Access to the Owner Controlled Area (OCA), site Protected Area (PA), and areas within the plant structures will be addressed under this access contingency.

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 in order to move or remove debris from the needed travel paths.

Vehicle access to the 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 Cooling Tower.

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. SBK 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 for NSRC equipment receipt, located outside the PA. Debris removal for the pathway between the staging areas and the final locations may be required. Deployment routes will be analyzed for soil liquefaction [Pending Action 38].

Figure 4 FLEX Equipment Storage Service Water Pump House and Haul Routes

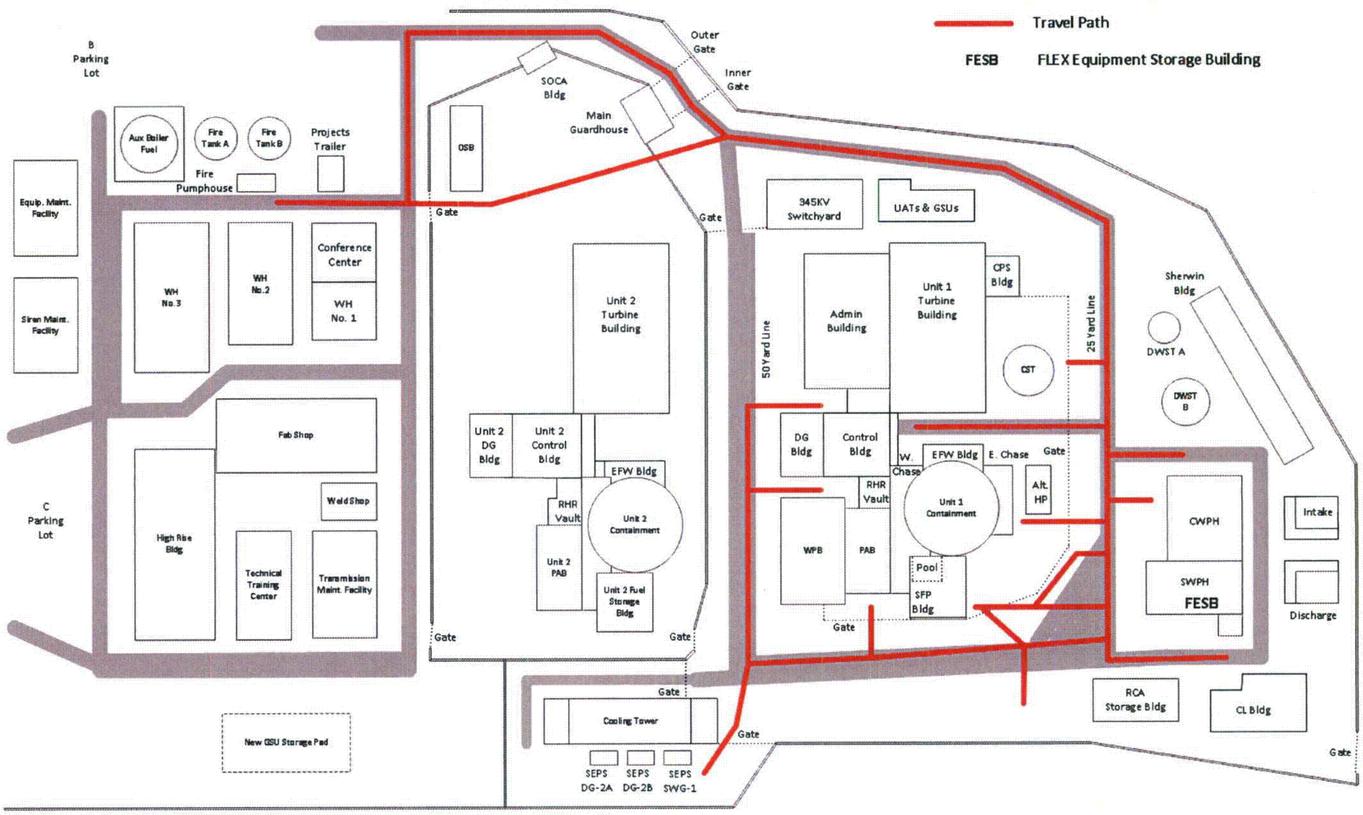


Figure 5 Equipment Staging Area B

Figure 6 Alternate Staging Area B and Primary Helipad Alternate Helipad

Figure 7 Travel Paths

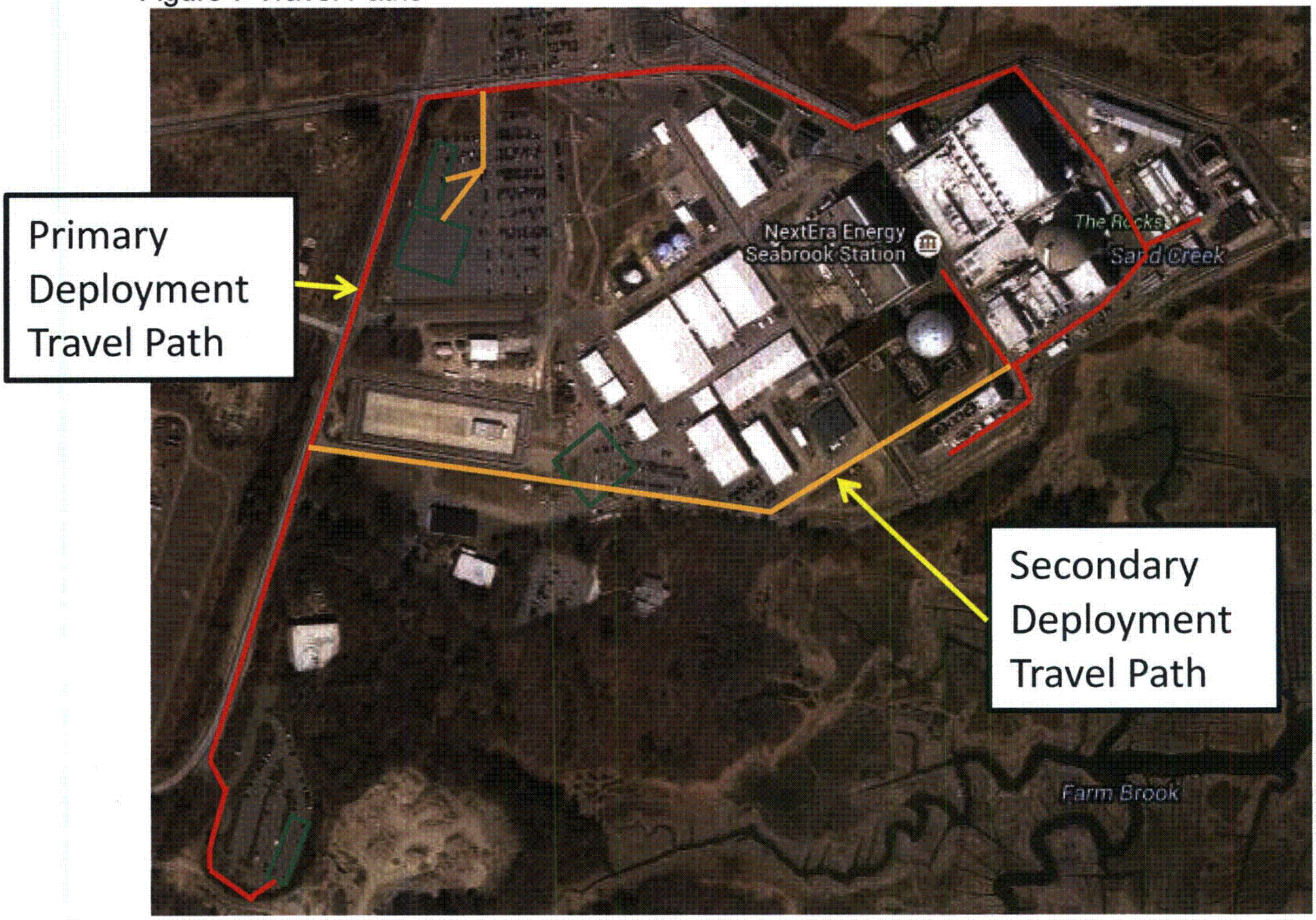


FIGURE 8 Staging Locations

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 FLPP is connected to TDEFW discharge connections located within a seismic Category I, missile structure. The portable, diesel driven FLPP will be transported from the SWPH FLEX storage area to a location near the CST. The FLPP primary suction connection is the outlet connection located inside the seismic Category I, EFW Pump House.

In the case where the CST is unavailable, the FLPP will be deployed to utilize one of the alternate water supplies of water for RCS cooling and heat removal with flow directly to the suction of the portable diesel driven FLPP.

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

The portable FLPP stored in the SWPH will be deployed to the preferred suction on the RWST. The suction connections are located on the RWST header to SFP makeup. The preferred discharge is to the positive displacement pump (PDP) discharge header. The alternate RCS makeup strategy will be from the BAT. An alternate discharge path is through SI-V-239. The primary and backup connections are located in Seismic Category I structures and accordingly, these connections are protected against all BDBEE hazards. The primary and alternate connections are in separate locations.

3.7.2.3. 480V Repowering FLEX Equipment Deployment

The FLEX 480 VAC generator will be used to provide power for additional instrumentation in the event that SEPS is available. If SEPS is not available the FLEX 480 V generator will be used to recharge the station batteries via the portable battery charger connection.

The battery room ventilation fans will be powered by the FLEX 480V generator when charging the batteries with SEPS unavailable.

3.7.2.4. 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 diesel driven portable equipment, i.e., pumps and generators and to refuel the SEPS is to draw fuel oil out of the EDG Fuel Oil Storage Tanks (FOST). 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. 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 EDGs.

Fuel is pumped to the portable diesel fuel transfer cart that is stored in the SWPH FLEX storage area. The transfer cart has a capacity of approximately 1,000 gallons and uses a small portable generator (also stored in the SWPH) to power an electric transfer pump stored in the EDG building near the EDGFOST. The transfer cart will be deployed from the SWPH to a location outside the diesel building where it will be filled and used to refill the FLEX equipment fuel tanks including the SEPS. The transfer cart has a portable diesel pump to offload fuel to the larger FLEX equipment.

Guidance will be developed to provide operating instructions, fuel burn up rates and fueling strategies for all portable diesel driven FLEX equipment [Pending Action 6].

Each SEPS genset has a 6050 gallon fuel oil storage tank with a Technical Requirement TR-31-3.1 minimum value of 4775 gallons [Ref 4.35] Based on actual measurement from SEPS surveillance testing, the fuel consumption rate for each generator at rated load is approximately 178 gallons per hour. Assuming that SEPS fuel level is at the TR-31-3.1 required minimum level at the time of the ELAP event, each genset can power ELAP loads for greater than 26 hours. It is anticipated that the operating crew will evaluate refueling strategies for SEPS relatively early in the event. This action should not be delayed past 24 hours to allow adequate time for strategy implementation.

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 BDBEE. The two EDGFOSTs, which are protected from BDB hazards, have adequate capacity to provide the on-site FLEX equipment with diesel fuel for greater than 28 days.

Off-site sources of diesel fuel will be used to supplement the onsite supply.

The BDBEE response strategy includes a very limited number of small support engine powered equipment (chain saws, chop saws and small electrical generator units). 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 (2) National SAFER Response Centers (NSRCs) to support utilities during a BDBEE. SBK has established contracts with the Pooled Equipment Inventory Company (PEICo) to participate in the process for support of the NSRCs as required. Each NSRC will hold five (5) sets of equipment, four (4) 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 or adaptors are provided with the equipment supplied from the NSRC. In the event of a BDBEE and subsequent ELAP/LUHS condition, equipment will be moved from an NSRC to a local assembly area. For SBK, 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 SBK site and staged at the onsite staging areas by helicopter if ground transportation is unavailable. Communications will be established between the SBK 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 Playbook."

The equipment stored and maintained at the NSRC for transportation to the local assembly area to support the response to a BDBEE at SBK is listed below. This includes the equipment that is specifically credited in the FLEX strategies for SBK but also lists the equipment that will be available for backup/replacement should on-site equipment break down.

- 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

Following a BDBEE and subsequent ELAP event if the SEPS is not available, ventilation providing cooling to occupied areas and areas containing FLEX strategy equipment will be lost. With SEPS available one train of ventilation will be available. 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. Doors and energized cabinet doors will be opened and temporary fans/heaters will be used to provide ventilation/cooling/heating.

3.9.1. Equipment Operating Conditions

The key areas identified for all phases of execution of the FLEX strategy activities are the Control Room, EFW Pump House, Main Steam and Feedwater Pipe Chases, and the Essential Switchgear Room. These areas will be provided with portable ventilation fans and doors opened as required to ensure temperatures remain acceptable. Power is restored to the battery room ventilation fans to prevent any significant hydrogen accumulation.

3.9.2. Control Room Habitability

The doors to the Control Room will be opened and deployment of fans will further accommodate the heat load in the Control Room for long term habitability.

3.10. Water Sources

The CST is protected from all hazards and provides adequate inventory for the transition to RHR with the SEPS/cooling tower available. Table 2 – Water Sources for FLPP provides a list of the potential water sources that may be used to provide cooling water to the SGs or the SFP, and their capacities. Descriptions of the preferred water usage sources identified in Table 3 – Water Sources for FLPP are provided in sequence in which they would be utilized, based on their availability after an ELAP/LUHS event. As noted in Table 4 – Water Sources for FLPP at least one water source would survive all applicable hazards for SBK and is credited for use in FLEX strategies. The deployment of each strategy is performed prior to the depletion of the CST.

The BATS are a protected source of borated water. The RWST can also be used for both RCS and SG makeup. The RWST water is demineralized and borated. The RWST is qualified for seismic and flood hazards and located within a Seismic Category I building. The building roof is vulnerable to vertical missiles but protected from all other hazards.

The Unit 2 CW piping cistern is a potable water source that is missile protected. This source of water can be used for both SG and SFP makeup.

Makeup water from the fire tanks and Demineralized Water Storage Tanks (DWSTs) incorporate separation features.

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/Cooling Tower or delivery and deployment of the NSRC 4160V generators and LUHS pumping system and transition to Shutdown Cooling.

3.11. Shutdown and Refueling Analyses

SBK will abide by the Nuclear Energy Institute position paper entitled "Shutdown/Refueling Modes" [Ref 4.36] addressing mitigating strategies in shutdown and refueling modes. This position paper is dated September 18, 2013 and has been endorsed by the NRC staff in ML13267A382 [Ref 4.37].

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 will provide guidance that can be employed for a variety of conditions [Pending Action24]. Clear criteria for entry into FSGs will ensure that FLEX strategies are used only as directed for BDBEE 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. The transition from

ECA-0.0 is based on availability of the SEPS diesels to re-power an emergency bus and entry to FSG-0.0, or if no emergency bus can be re-energized, entry into FSG-0.1. Each FSG procedure 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 operation and deployment 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, 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.

FSGs have been developed in accordance with PWROG guidelines. FSGs will be reviewed and validated by the involved groups to the extent necessary to ensure the strategy is feasible. Validation may be accomplished via walk-throughs or drills of the guidelines and will abide by the draft guidance provided by NEI.

3.12.2. Training

NextEra Energy Nuclear Training Program will be revised to assure personnel proficiency in the mitigation of BDBEE is adequate and maintained [Pending Action 37]. These programs and controls were developed and are being implemented in accordance with the Systematic Approach to Training (SAT) 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 BDBEE 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.

4. References

(D) – Docketed, (ND) – Not Docketed

4.1. D Seabrook Technical Specifications
4.2. D Seabrook Updated Final Safety Analysis Report (UFSAR)
4.3. D Task Interface Agreement (TIA) 2004-04, Acceptability of Proceduralized Departures from Technical Specifications (TSs) Requirements at the Surry Power Station, (TAC Nos. MC4331 and MC4332), dated September 12, 2006. (Accession No. ML060590273)
4.4. D SECY-11-0093 Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated July 12, 2011
4.5. D EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012
4.6. D EA-12-051, 3/12/12, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation
4.7. D JLD-ISG-12-03, 5/31/12, Draft Interim Staff Guidance for Compliance with Order EA-12-051 Concerning Spent Fuel Pool Instrumentation
4.8. ND FPXXXXXX, RCS Inventory Control & Long Term Subcriticality Analysis (Westinghouse)
4.9. ND C-X-1-XXXXX-CALC, Decay Heat Calculation
4.10. ND C-X-1-XXXXX-CALC, Feedwater Usage and CST Availability
4.11. ND C-X-1-XXXXX-CALC, Feedwater Quality Requirements
4.12. ND EC 282257, Instrumentation Evaluation For Beyond Design Basis Events
4.13. ND EC 282426, SBC-227-Calc Revision 5 DC System Evaluation For Station Blackout And Beyond Design Basis External Events
4.14. ND EC 280553, Loading of a Single SEPS Generator Set for a Beyond Design Basis Extended Loss of AC Power
4.15. ND EC XXXXXX, Portable Diesel Generator Load Study
4.16. NDC-X-1-20718-CALC, Diverse and Flexible Coping Strategy Hydraulic Analysis (not issued)
4.17. ND C-X-1-XXXXX-CALC, Containment Pressure and Temperature following a BDBEE
4.18. ND C-X-1-25119-CALC, FLEX Fuel Transfer Pump Sizing Calculation (not issued)
4.19. ND INPO Event Report (IER) 11-04, Near-Term Actions to Address the Effects of an Extended Loss of All AC Power in Response to the Fukushima Dai-ichi Event

4.20. ND NextEra Energy Letter SBK-L-13038 dated February 26, 2013, NextEra Energy Response to INPO Level 1 Event Report 11-4, Near-Term Actions to Address the Effects of an Extended Loss of All AC power in Response to the Fukushima Daiichi Event

4.21. ND NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Rev 0

4.22. ND NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, Rev 1.

4.23. ND WCAP-17601-P, Rev 0, Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs.

4.24. ND EC 282982, Fukushima FLEX Unit 2 CW Supply Pipe Converted to Water Storage.

4.25. ND EC 282186, Bus 5&6 Connection for NSRC Generators.

4.26. ND C-X-1-20718-CALLC, Diverse and Flexible Coping Strategy Hydraulic Analysis (not issued).

4.27 ND ECA-0.0 Loss of All AC Power

4.28 ND Calc SBC-227-CALC, DC System Evaluation for Station Blackout

4.29 D TR-FSE-14-1-P Revision 1, Use of Westinghouse SHIELD Passive Shutdown Seal for FLEX Strategies

4.30 ND Calc XXX-XXX, Borated Water Injection from BAT/RWST Adequate to Meet Shutdown Margin limits.

4.31 D ML14132A128, NRC Endorsement of Westinghouse TR-FSE-14-1-P Revision 1 With Conditions, dated 28 May 2014

4.32 ND Procedure xxxxxxx, Gravity Drain RWST to SFP

4.33 ND NRC Regulatory Guide 1.76, ...

4.34 ND NRC Regulatory Guide 1.221, ...

4.35 Technical Requirement TR-31-3.1, ...

4.36 NEI position paper "Shutdown/Refueling modes'

4.37 ML13267A382,dated September 30, 2013

5. Integrated Plan Pending Actions

The following Table provides a summary of the Pending Items documented in the Integrated Plan:

	Integrated Plan Pending Actions	**Status**
1	Revise ECA-0.0 to include steps to transition to FLEX Support Guidelines (FSGs) when an extended loss of offsite power event is in progress. This determination will delineate future procedural strategies and transitions.	In Progress
2	Develop FSG-0.0 attachments to include a SEPS load reduction method for an extended loss of offsite power event to control SEPS loading within the capacity of one engine.	In Progress
3	A seismic evaluation will be conducted on the connections that penetrate the upper half of the Condensate Storage Tank (CST) to determine if Seabrook can take credit for the entire tank volume for Phase 1 & 2 event coping.	Complete, no credit will be taken for the non-seismic volume in the CST.
4	Develop FSG-0.0 to add a step to manually shutdown the motor-driven Emergency Feedwater (EFW) pump if the Turbine Driven (TD)EFW pump is running satisfactorily.	In Progress
5	Add an Attachment to ES-0.2, ES-0.3 and ES-0.4 that provides a Table of electrical loads for responding to an extended loss of offsite power event.	Closed. Incorporated into item 2.
6	Develop a SEPS generator set (genset) refueling strategy from 1) an offsite supplier outside a 25 mile radius from the station (primary strategy), and 2) the Emergency Diesel Generator (EDG) fuel oil storage tanks using a refueling trailer stored in the Service Water (SW) Pumphouse (backup strategy). This strategy will include provisions for refueling within 24 hours in the event that only a single SEPS is functional.	In Progress

	Integrated Plan Pending Actions	**Status**
7	Develop FSG-5 and FSG-5.1 to include a step for implementation of a SEPS genset refueling strategy.	In Progress
8	Develop a FSG for refueling SEPS from the EDG fuel oil storage tanks using a portable refueling trailer. Utilize the information contained in existing procedure OS1061.02, 'Receipt of SEPS Fuel Oil', for development of the FSG.	In Progress
9	Develop FSG-5 to include direction for connecting the backup diesel-driven air compressor to the Service Air system to restore Instrument Air system pressure.	In Progress
10	Develop required Preventive Maintenance actions and Surveillance test procedures for the refueling trailer to be procured and stored in the SW Pumphouse.	In Progress
11	Revise AOPs to include transitions to FSG-11 and FSG-14 when Extended Loss of all AC Power (ELAP) is in progress for shutdown mode strategies.	Not Started
12	Conduct an Engineering Evaluation to determine if the existing hurricane enclosures for the SEPS gensets provide adequate missile protection. If protection is not adequate, develop a design change (EC) to add missile protection for the SEPS gensets.	Complete. SEPS missile protection is not being added. Other missile protected strategies are being added. (See new pending actions 24-37 below)
13	Evaluate the 'seismic robustness' of SEPS and determine if enhancements are needed with respect to the new Ground Motion Response Spectrum (GMRS) data for the site. This data will not be available until the seismic hazard re-evaluation is conducted in accordance Recommendation 2.1 of the RFI letter.	In Progress
14	Once the site flooding re-evaluation is completed in accordance with Recommendation 2.1 of the RFI letter, determine if additional flood protection is necessary for SEPS.	Not Started

	Integrated Plan Pending Actions	Status
15	Formalize the Engineering assessment of ELAP load capacity for a single SEPS genset and modify procedural guidance in the applicable Emergency Operating Procedures (EOPs) and FSGs, as necessary.	In Progress
16	Evaluate the impact of missile protection barriers that may be installed to protect the SEPS gensets on the capability to implement the snow removal plan and revise the plan as necessary.	Complete. SEPS missile protection will not be added.
17	Determine if a quantity of diesel fuel will be provided from the National SAFER Response Centers (NSRCs) along with requested Phase 3 portable equipment. If not, establish a contract with a fuel supplier outside a 25 mile radius from the plant to provide fuel within 48 hours of a Beyond Design Basis External Event (BDBEE).	In Progress
18	Develop a FSG for staging and deployment of Phase 3 equipment from the RRCs into the Protected Area (PA).	In Progress
19	Develop a FSG for connecting the two 1MW generators from the NSRC to 4.16 KV Emergency Buses E5 and E6 and a 1MW generator from the NSRC to 480V Busses E53 and E63.	In Progress
20	Develop a FSG for refueling the NSRC generators or incorporate this action into the SEPS refueling FSG.	In Progress
21	Implement low leakage RCP seals on all four RCPs to minimize RCS leakage into Containment.	All four seals are planned to be replaced with the low leakage seal design in October 2015.
22	Based on PWROG guidance, determine if new FSGs are required that incorporate the existing guidance provided in SAG-1, 'Inject to the SGs', and SAG-3, 'Inject to the RCS' or whether transition points to these two Severe Accident Management Guidelines (SAMGs) should be added to the applicable EOPs.	Complete, new FSGs are being developed for Steam Generator (SG) and RCS injection in the event SEPS is unavailable using alternate Flex RCS makeup connections.

	Integrated Plan Pending Actions	Status
23	Develop a method for obtaining local readings for the 12 critical parameters identified in the Integrated Plan and include in site procedures as appropriate.	Complete.
24	Develop Westinghouse FSGs to support ELAP strategies with SEPS unavailable.	In Progress
25	Develop EC to use existing below grade Unit 2 Circulating Water (CW) abandoned piping section as a holding tank for credited makeup in SG injection strategies.	In Progress
26	Perform analysis to qualify Unit 2 CW piping as a credited makeup source in seismic and missile related events	In Progress
27	Perform Gothic analysis for containment pressure & temperature response after installation of RCP shutdown seals to ensure containment integrity is not challenged without containment cooling.	In Progress
28	Perform analysis for SG feedwater quality requirements to ensure continued SG heat sink capability for 72 hours following loss of AC power.	In Progress
29	Perform analysis for RCS boration and cooldown strategies to support FSG development	In Progress
30	Complete SG, Spent Fuel Pool (SFP), and RCS makeup hydraulic analysis for Flex strategies in modes 1-6.	In Progress
31	Complete FSG setpoint calculations and basis	In Progress
32	Complete Flex equipment storage building analysis and develop EC for SW pumphouse building mods.	In Progress
33	Complete Site flooding analysis and add any interim actions to OS1200.03, Severe Weather Conditions	In Progress
34	Procure site Flex portable equipment to augment Seabrook BDBEE response strategies.	In Progress

	Integrated Plan Pending Actions	Status
35	Complete ECs for plant system Flex connections for Fire Tanks, EFW pumphouse, Demineralized Water Storage Tanks (DWSTs), and Positive Displacement Charging Pump.	In Progress
36	Complete Analysis for > 8 hrs heat removal using CST	In Progress
37	Revise the NextEra Energy Nuclear Training Program to assure personnel proficiency in the mitigation of BDBEE is adequate and maintained.	In Progress
38	Complete the travel route soil liquefaction study.	In Progress
39	Modify the SWPH entrance with a new Barrier I missile door to allow for rapid deployment with missile protection.	In Progress

Attachment 1 SEPS GENSETS

ATTACHMENT 2

Technical Descriptions of SEPS and the Service Water Cooling Tower

Supplemental Emergency Power System (SEPS)

SBK 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 4.16kV Emergency Bus (Bus E6 preferred). This meets the alternate connection criterion of NEI 12-06 (see Figures 1 & 2 in Attachment 3).

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.

Service Water Cooling Tower

NEI 12-06 assumptions include loss of normal access to the UHS. In the SBK case that would be the train-related ocean service water pumps in the SWPH.

The SW Cooling Tower is a standby ultimate heat sink that is part of station design. The Cooling Tower is a Seismic Category 1 structure that is flood protected. Its function is to provide cooling water to the safety-related SW system should a seismic event partially collapse the intake and/or discharge cooling water tunnels to the Atlantic Ocean.

The Cooling Tower consists of a large basin of fresh/brackish water (approx. 4 million gallons), two train-related cooling tower pumps, and three train-related forced draft fans. The basin is significantly over-sized as it was designed for two units and only Unit 1 was completed at SBK.

The Cooling Tower design can support 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 Cooling Tower operation is expected before basin makeup would be required.

Basin makeup is normally provided from the potable water system or the station fire main. Makeup can also be provided by a Technical Specification-required portable diesel-driven pump that is pre-staged in the seismic Category 1 SWPH.