Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

February 17, 2016
NOC-AE-15003311
10 CFR 2.202

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

South Texas Project
Units 1 & 2
Docket No. STN 50-498, STN 50-499
Notification of Full Compliance with Order EA-12-049 for
Mitigation Strategies for Beyond Design Basis External Events and
Update for Order EA-12-051 for Reliable Spent Fuel Pool Instrumentation

References:

1. NRC Order Number EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events", March 12, 2012 (AE-NOC-12002268)(ML12073A195)

2. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Notification of Compliance with Orders EA-12-049 for Mitigation Strategies for Beyond-Design Basis External Events and EA-12-051 for Reliable Spent Fuel Pool Instrumentation (TAC Nos. MF0826 and MF0828)", July 2, 2015 (NOC-AE-15003257)(ML15196A031)

3. Letter from D.L. Koehl, STPNOC, to NRC Document Control Desk, "STPNOC Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", February 28, 2013 (NOC-AE-13002963) (ML13070A011)

4. Letter from J.S. Bowen, NRC, to D.L. Koehl, STPNOC, "Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC Nos. MF0825 and MF0826)", January 29, 2014 (AE-NOC-14002494)(ML13339A736)

5. Letter from T. Brown, NRC, to D.L. Koehl, STPNOC, "South Texas Project, Units 1 and 2 – Report for the Onsite Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0825, MF0826, MF0827, and MF0828)", May 6, 2015 (AE-NOC-15002661) (ML15111A465)

6. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Report of Full Compliance with Order EA-12-051 Reliable Spent Fuel Pool Instrumentation," January 19, 2016 (NOC-AE-15003297)

A151
NRR

STI 34239725

The purpose of this letter is to fulfil the requirement to report to the NRC that STP Unit 1 and Unit 2 are in full compliance with Order EA-12-049 (Reference 1) regarding mitigation strategies for Beyond-Design-Basis External Events. Notification for STP Unit 2 compliance is documented in a previous submittal (Reference 2).

Section IV.A.2 of Order EA-12-049 requires full implementation no later than two refueling cycles after submittal of the Overall Integrated Plan (Reference 3) or December 31, 2016, whichever comes first. In addition, Section IV.C.3 of Order EA-12-049 requires that licensees report to the NRC when full compliance is achieved. On December 19, 2015, STP Unit 1 entered Mode 2 (Startup). STP Unit 1 and Unit 2 were in full compliance with both Order EA-12-049 and EA-12-051 at that time. Reference 6 submitted the report of full compliance for Order EA-12-051.

The Enclosure for this letter provides a brief summary of the key elements associated with compliance with Order EA-12-049 including a completed milestone accomplishment schedule.

Attachment 1 includes summary responses for the open and confirmatory items from the NRC's Interim Staff Evaluation (ISE) of STP's Overall Integrated Plan (Reference 4). The information contained in Attachment 1 is considered legacy information and may not accurately reflect the current diverse and flexible coping (FLEX) strategies. The current STP FLEX strategies are described in the Final Integrated Plan (FIP) (Attachment 4).

Attachment 2 provides a clarification related to the response to open and pending items documented in the Onsite Audit Report (Reference 5) that were provided with the STP Unit 2 Order compliance letter (Reference 2).

Attachment 3 provides responses to other NRC questions that arose after the Audit Report was issued. STPNOC considers the response items listed in Attachments 1 through 3 complete pending NRC closure.

Attachment 4 to this letter is the STP FLEX Final Integrated Plan (FIP) that includes a summary of FLEX strategies, descriptions of FLEX equipment and descriptions of applicable hazards.

There are no regulatory commitments in this letter.

If there are any questions, please contact Wendy Brost at (361) 972-8516 or me at (361) 972-7566.

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

Executed on: February 17, 2016

G. T. Powell
Site Vice President

web

Enclosure: Summary of Compliance with NRC Order EA-12-049 Regarding Mitigation Strategies for Beyond-Design-Basis External Events and Update of Compliance Date for Order EA-12-051 Regarding Reliable Spent Fuel Pool Instrumentation

Attachments:
1. Summary of Responses for the FLEX Interim Staff Evaluation Open and Confirmatory Items
2. Update to Response to Open and Pending Items from the FLEX and SFPLI Audit Report
3. Summary of Reponses for Other Issues that Arose after the Audit Report
4. STP FLEX Final Integrated Plan (FIP)

cc:

(paper copy)

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
1600 East Lamar Boulevard
Arlington, TX 76011-4511

Lisa M. Regner
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North (O8 H04)
11555 Rockville Pike
Rockville, MD 20852

NRC Resident Inspector
U. S. Nuclear Regulatory Commission
P. O. Box 289, Mail Code: MN116
Wadsworth, TX 77483

Milton Valentin
Project Manager
Orders Management Branch
Japan Lessons-Learned Division
U.S. Nuclear Regulatory Commission
One White Flint North (MS 13F15)
11555 Rockville Pike
Rockville, MD 20852

(electronic copy)

Morgan, Lewis & Bockius LLP
Steve Frantz, Esquire

U.S. Nuclear Regulatory Commission
Lisa M. Regner
Milton Valentin
Tony Brown

NRG South Texas LP
John Ragan
Chris O'Hara
Jim von Suskil

CPS Energy
Kevin Pollo
Cris Eugster
L. D. Blaylock

Crain Caton & James, P.C.
Peter Nemeth

City of Austin
Elaina Ball
John Wester

Texas Dept. of State Health Services
Richard A. Ratliff
Robert Free

ENCLOSURE

Summary of Compliance with NRC Order EA-12-049 Regarding Mitigation Strategies for Beyond-Design-Basis External Events and Update of Compliance Date for Order EA-12-051 Regarding Reliable Spent Fuel Pool Instrumentation

1. Introduction

STP Nuclear Operating Company (STPNOC) developed an Overall Integrated Plan (OIP) (Reference 3) to provide diverse and flexible coping (FLEX) strategies in response to Order EA-12-049 (Reference 1). The final FLEX strategies differ from the strategies described in the OIP. Strategy updates have been submitted through periodic six-month update letters (References 6 - 10).

The information provided in this submittal documents compliance with Order EA-12-049 for STP Units 1 and 2. Compliance with the related Order EA-12-051 (Reference 11) regarding reliable spent fuel pool level indication (SFPLI) for STP Unit 1 and Unit 2 was submitted in January 2016 (Reference 12). Additionally, a compliance letter for both Orders specific to Unit 2 was submitted in July 2015 (Reference 2).

2. Milestone Accomplishments

Issues from the NRC Interim Staff Evaluation (ISE) for FLEX Order compliance (Reference 4) have been addressed by STPNOC. Responses to the ISE open and confirmatory items were provided to the NRC as part of the FLEX audit and are summarized in Attachment 1.

The issues that were identified as open and pending in the NRC Onsite Audit Report (Reference 5) are listed below. A summary of the response to each of the open and pending issues was provided in the FLEX and SFPLI Order Compliance letter for STP Unit 2 (Reference 2). The summary responses, including any revisions, are provided in Attachment 2. The open and pending items do not affect STP's compliance with Order EA-12-049:

ISE Open Item (ISE OI) - ISE OI 3.2.1.1.B

ISE Confirmatory Items (ISE CI) - ISE CI 3.2.1.2.C, ISE CI 3.2.1.3.A, ISE CI 3.2.1.4.A

Audit Questions (AQ) - AQ #25

Additional Safety Evaluation (SE) needed information – SE #9, SE #10, SE #11, SE #17

STPNOC has no remaining open or pending Licensee Identified Open Items.

3. Milestone Schedule Completion

FLEX Milestones and SFPLI Update (Units 1 and 2)	Completion Date
Submit Overall Integrated Plan	February 28, 2013
Six Month Updates	
1st Update	August 26, 2013
2nd Update	February 27, 2014
3rd Update	August 27, 2014
4th Update	February 26, 2015
5th Update	August 26, 2015
Walk-throughs or Demonstrations	April 30, 2015
Perform Staffing Analysis	
Phase 1 Staffing Assessment	June 3, 2013
Phase 2 Staffing Assessment	November 25, 2014
Revised Phase 2 Staffing Assessment	July 2, 2015
Modifications	
Unit 2 Modifications Design Completion	April 30, 2015
Unit 2 Final Modification Implementation	May 1, 2015
Unit 1 Modifications Design Completion	November 4, 2015
Unit 1 Final Modification Implementation	November 11, 2015
Storage	
Equipment Storage Complete	April 30, 2015
National SAFER Response Center (NSRC)	
NSRC Plan Requirements Complete	April 18, 2015
Procedures	
Issue Site-Specific FSGs	November 10, 2015
Issue Operations/Maintenance Procedures	November 10, 2015
Training	
Training Complete	March 2015
Unit 2 FLEX & SFPLI Compliance Date	May 7, 2015
Unit 1 FLEX & SFPLI Compliance Date	December 19, 2015
Submit Unit 2 FLEX Compliance Letter	July 2, 2015
Submit Notification of Full Compliance Letter[1]	February 17, 2015

[1] Action completed with this submittal

4. Order EA-12-049 Compliance Elements – Summary

STPNOC has completed implementation of Order EA-12-049 for STP Units 1 and 2 including the following elements:

Strategies – Complete

STP FLEX strategies are in compliance with Order EA-12-049. To meet the intent of the Order, STPNOC followed the guidance provided in NEI 12-06 (Reference 13) with the exception of the Alternate Approaches listed below. These Alternate Approaches have been presented to and discussed with the NRC review staff and are noted in the Onsite Audit Report (Reference 5):

- STP pre-staged some of the FLEX response equipment including two diesel generators in protected structures on top of the Mechanical Auxiliary Building (MAB) roof, and pumps, hoses, associated equipment inside existing Class 1 plant structures protected against design-basis external events. The primary reason for pre-staging this equipment is due to difficulties in retrieving and deploying equipment following a design-basis flooding event.

- STP utilizes two pre-staged pumps with separate injection pathways for Reactor Coolant System (RCS) fill instead of a single pump with primary and alternate connection points and injection pathways supplemented by a portable pump. In the STP strategy, the failure of a pre-staged pump would render one of the two injection pathways unavailable as opposed to the two pathways that would be available using the portable pump strategy. As a compensatory measure, STP reduced the allowed out of service time for both the positive displacement pump (PDP) and FLEX RCS makeup pump and their associated connections and flowpaths. STP FLEX strategies also rely on pre-staged pumps for Steam Generator (SG) makeup and SFP makeup, however, STP also has the ability to makeup to these systems using a portable pump.

These alternate approaches are listed in Section 3.5 of the STP FLEX Final Integrated Plan (FIP) submitted as Attachment 4.

Modifications – Complete

All modifications required to support the FLEX strategies for STP Units 1 and 2 have been fully implemented in accordance with station processes.

Equipment – Procured and Maintenance and Testing Performed – Complete

The equipment required to implement the FLEX strategies for STP Units 1 and 2 has been procured, received, initially tested and performance verified as recommended in accordance with NEI 12-06 (Reference 13) and is available for use. Maintenance and testing requirements for FLEX equipment are included in the STP Preventative Maintenance Program such that equipment reliability is monitored and maintained.

Procedures – Complete

STPNOC has developed FLEX Support Guidelines (FSGs) and integrated them into the existing procedure framework. Other affected procedures required for FLEX implementation have also been revised. The FSGs and applicable procedures have been verified and are available for use and are being controlled in accordance with station processes.

Training – Complete

All necessary training has been completed in accordance with the Systematic Approach to Training (SAT) as recommended in NEI 12-06.

Staffing – Complete

The STPNOC Phase 1 Staffing Assessment (Reference 14) was completed in accordance with the 10 CFR 50.54(f) request for information with respect to Near-Term Task Force (NTTF) Recommendation 9.3 for Emergency Preparedness (Reference 15). The STPNOC Phase 2 Staffing Assessment (Reference 16) was also completed in accordance with the 10 CFR 50.54(f) letter.

Following the development of the FSGs, STP performed a revalidation of the Phase 2 assessment to ensure the FLEX strategies could be implemented as written. STP determined that two additional maintenance personnel are required to implement the FLEX strategies for a two unit event in addition to the minimum on-shift staff required by the Emergency Plan for a single unit event. The needed personnel are currently procedurally obligated to be onsite at all times and STP has implemented administrative controls to ensure these staffing levels are maintained.

The results of the revalidation were communicated to the NRC and the Revised Phase 2 Staffing Assessment that resulted from the revalidation efforts was submitted to the NRC on July 2, 2015 (Reference 17).

Additionally, during the implementation outage for Unit 1, STP determined that an additional personnel action was needed for one of the FLEX strategies. In an event such as a flood from an embankment breach of the Main Cooling Reservoir, the site is flooded to a degree that the Trailer-Mounted Diesel-Driven Pumps (TMDDPs) cannot be used to transfer water to the Auxiliary Feedwater Storage Tank (AFWST) until later in the event. In this case, the condensate Deaerator (DA) can be used as a makeup water source for the AFWST until flood waters recede.

STP FSG-06 (Reference 18) directs Operators to connect hoses between the DA and the Auxiliary Feed Pump Test Line Drain Valve which supplies the AFWST. Prior to opening the DA storage tank drain valve, STP determined that the DA must be vented for at least seven hours to preclude the release of two-phase water into the transfer hoses.

STP reviewed the Revised Phase 2 Staffing Assessment (Reference 17) and determined that there would be a person in each unit who could perform this task, if needed, among the on-shift staffing available. Steam suits and hearing protection are staged in the Turbine Generator Building (TGB) that can be used for completing this venting action (Reference 18).

A supplement to the Revised Phase 2 Staffing Assessment will be submitted to the NRC to provide additional details (Reference 19).

National SAFER Response Center (NSRC) – Complete

STPNOC has joined the Strategic Alliance for FLEX Emergency Response (SAFER) Team Equipment Committee for off-site facility coordination. A site-specific SAFER Response Plan has been developed (Reference 20) and the requisite equipment is available at the NSRCs to support Phase 3 FLEX implementation in the event that it is needed.

Validation – Complete

STPNOC has completed validation of the FLEX strategies using station processes and in accordance with industry developed guidance to assure required tasks, manual actions and decisions for FLEX strategies are feasible and may be executed within the constraints identified in the FLEX strategy timeline.

FLEX Program Document – Established

STPNOC developed a FLEX Program Document (Reference 21) in accordance with the requirements of NEI 12-06. Additionally, STP developed the FLEX FIP that includes a summary of FLEX strategies, descriptions of equipment, and descriptions of applicable hazards (Attachment 4).

References

1. NRC Order Number EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events", March 12, 2012 (AE-NOC-12002268)(ML12073A195)

2. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Notification of Compliance with Orders EA-12-049 for Mitigation Strategies for Beyond-Design Basis External Events and EA-12-051 for Reliable Spent Fuel Pool Instrumentation (TAC Nos. MF0826 and MF0828)", July 2, 2015 (NOC-AE-15003257)(ML15196A031)

3. Letter from D.L. Koehl, STPNOC, to NRC Document Control Desk, "STPNOC Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", February 28, 2013 (NOC-AE-13002963)(ML13070A011)

4. Letter from J.S. Bowen, NRC, to D.L. Koehl, STPNOC, "Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC Nos. MF0825 and MF0826)", January 29, 2014 (AE-NOC-14002494)(ML13339A736)

5. Letter from T. Brown, NRC, to D.L. Koehl, STPNOC, "South Texas Project, Units 1 and 2 – Report for the Onsite Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0825, MF0826, MF0827, and MF0828)", May 6, 2015 (AE-NOC-15002661) (ML15111A465)

6. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC First Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", August 26, 2013 (NOC-AE-13003027)(ML13249A060)

7. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC Second Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", February 27, 2014 (NOC-AE-14003089)(ML14073A458)

8. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC Third Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)(TAC Nos. MF0825 and MF0826)", August 27, 2014 (NOC-AE-14003162)(ML14251A029)

9. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC Fourth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)(TAC Nos. MF0825 and MF0826)", February 26, 2015 (NOC-AE-15003224)(ML15075A019)

10. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC Fifth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)(TAC Nos. MF0825 and MF0826)", August 26, 2015 (NOC-AE-15003287)(ML15251A208)

11. NRC Order Number EA-12-051, "Issuance of Order to Modify Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation," March 12, 2012 (AE-NOC-12002271) (ML12054A679)

12. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Report of Full Compliance with Order EA-12-051 Reliable Spent Fuel Pool Instrumentation," January 19, 2016 (NOC-AE-15003297)

13. Nuclear Energy Institute (NEI) Guidance 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, August 21, 2012 (ML12242A378)

14. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Revised Phase 1 Staffing Assessment Submitted in Response to Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights", June 3, 2013 (NOC-AE-13003004)(ML13182A021)

15. Letter from E.J. Leeds, NRC, to All Power Reactor Licensees, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident", March 12, 2012 (AE-NOC-12002269) (ML12053A340)

16. Letter from A. Capristo, STPNOC, to NRC Document Control Desk, "Response to Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident – Phase 2 Staffing Assessment", November 25, 2014 (NOC-AE-14003189)

17. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Supplement to Response to Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident – Phase 2 Staffing Assessment", July 2, 2015 (NOC-AE-15003255)

18. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG06, "Alternate AFWST Makeup", Revision 1, November 10, 2015 (STI 34237577)

19. STP Condition Reporting Database Action, CR 12-11657-38

20. STPNOC Vendor Technical Document, VTD-A977-0003, "SAFER Response Plan for South Texas Project Electric Generating Station", Revision 0 (STI 34077493)

21. STPNOC Document, FLEX-0001, "Diverse and Flexible Coping Strategies (FLEX) Program Document", Revision 0 (STI 33759523)

22. STPNOC Calculation, STP-CP-006, "ELAP Analysis with the South Texas Project RETRAN-02 Input Model", Revision 1, April 15, 2015 (STI 34064235)

ATTACHMENT 1

Summary of Responses for the FLEX Interim Staff Evaluation Open and Confirmatory Items

The information summarized in this Attachment was discussed with the NRC review staff during the FLEX and SFPLI audit process and was previously provided electronically on the CERTREC Inspection Management System (IMS) portal.

Note: The information contained in this attachment is considered legacy information and may not accurately reflect the current FLEX strategies. The current STP FLEX strategies are described in the Final Integrated Plan (FIP). The intent of providing this information is to show the evolution of the STP FLEX strategies and to document some of the discussions with the NRC Review Staff following the issuance of the Interim Staff Evaluation (ISE) during the audit process.

Identifying Number	Question/Request	STP Response
3.1.1.2.A	Confirmatory Item: The licensee should confirm the need for, or use of, auxiliary power to facilitate moving or deploying FLEX equipment.	No auxiliary power will be required to move or deploy portable FLEX equipment.
3.1.1.3.A	Confirmatory Item: Although the Integrated Plan briefly discusses the use of portable instruments to obtain necessary instrument readings at the qualified display processing system, the plan does not fully address the guidance of NEI 1206, Section 5.3.3, consideration 1 regarding providing operators with adequate information to obtain these readings.. During the audit process, the licensee stated that this concern would be addressed by the development and incorporation of the guidance provided in the Westinghouse Owners Group FLEX emergency response guidelines.	Guidance is captured in the FSGs.
3.1.1.3.B	Confirmatory Item: The licensee's Integrated Plan did not address the development of mitigating strategies with respect to the procedural interface for the use of ac power to mitigate ground water in critical locations. Confirm that the corrective action initiated to address this issue is complete.	See CR Action 12-11658-117. STP Engineering analysis determines that no impact to FLEX equipment is expected due to groundwater.
3.1.2.2.B	Confirmatory Item: The Integrated Plan did not confirm that, for flood considerations, power is available for water extraction sump pumps, or that temporary flood barriers would be employed appropriately.	STP does not credit sump pumps or temporary flood barriers in their flood protection for safety related equipment or areas during an ELAP.

Identifying Number	Question/Request	STP Response
3.1.3.3.A	Confirmatory Item: The Integrated Plan made reference to developing procedures to implement strategies as indicated by a licensee identified open item (OI#9). Confirm that the procedures address considerations for high winds such as personnel protection or removing debris as well as the high temperature hazard.	The FSGs reference specific STP safety procedures. These procedures will ensure shift management provides safe direction while working in adverse environmental conditions.
3.1.5.2.A	Confirmatory Item: With regard to a concern regarding addressing the high heat hazard for deployment, the licensee generated two self-identified open items (OI#4 and #9) to track the resolution of storage location, protection, and transportation, and the administrative requirements associated with those elements. Confirm that considerations for high heat of FLEX equipment deployment and procedural interfaces are part of the resolution.	The tractors and Trailer-Mounted Diesel-Driven Pumps (TMDDPs) are designed to operate in high heat conditions. This equipment is commercial equipment of very good quality typically used on farms and ranches in South Texas. Their storage locations will be ventilated by means of natural circulation. Transporting the equipment to the Protected Area will occur after offsite resources arrive (beyond 6 hours following event); therefore, personnel can monitor coworkers for signs of overheating. There will be no problem moving and operating this equipment with outside ambient temperatures around 100°F.
3.2.1.2.A	Confirmatory Item: Confirm that two-phase leakage from the reactor coolant pump (RCP) seals will not occur prior to the transition to reflux cooling.	See CR 12-11656-12 for minimum time for RCS Reflux cooling to occur. Two phase flow at the RCP seals is expected to occur prior to the transition to reflux cooling. Limitation 1.3.4 in the RETRAN3D White Paper states that the results will not be used beyond the point when two phase flow passes through the RCP seals. The RETRAN3D analysis will demonstrate that two phase flow through the RCP seal will not occur.
3.2.1.2.B	Confirmatory Item: Provide confirmation of the acceptability of assuming a constant seal leakage area in light of the potential for increased stresses on seal materials during cooldown.	The assumption of a constant seal leakage area is being revised based on work being performed by the PWROG and under review by the NRC staff. The results of this work will be factored into the RETRAN3D analysis.

Identifying Number	Question/Request	STP Response
3.2.1.2.C	Confirmatory Item: In some plant designs, such as those with 1200 to 1300 psia SG design pressures and no accumulator backing of the main steam system PORV actuators, the cold legs could experience temperatures exceeding 580 degrees F before cooldown commences. This is beyond the qualification temperature (550 degrees F) of the O-rings used in the RCP seals. For such Westinghouse designs, a discussion of the information (including the applicable analysis and relevant seal leakage testing data) should be provided to justify that (1) the integrity of the associated O-rings will be maintained at the temperature conditions experienced during the ELAP event, and (2) the seal leakage rate of 21 gpm/seal used in the ELAP is adequate and acceptable.	In Letter OG 13399, Westinghouse has documented the test results that demonstrate the RCP O-rings will withstand temperatures of 583°F for periods longer than 14 hours, which is beyond the conditions that will be experiencedduring an ELAP event. The RCP seal leakage rate of 21 gpm is being revised based on work performed by the PWROG and under review by the NRC Staff. As discussed in the RETRAN3D White Paper dated August 21, 2014 the results of this work will be applied to the RETRAN3D analysis..
3.2.1.3.A	Confirmatory Item: The licensee should address the following issues associated with decay heat modeling: (1) specify the value of the multiplier applied to the ANS 5.1 1979 decay heat standard for the ELAP event and its basis. (2) Clarify whether the multiplier would be capable of accounting for the residual heat contribution from actinides (e.g., plutonium, neptunium) and neutron absorption in fission products, or whether these residual heat sources were accounted for explicitly. (3) Clarify whether the discussion applies to RETRAN3D thermal-hydraulic analysis or whether it applies to auxiliary calculations (e.g., the determination of steam generator makeup required during various phases of the ELAP coping analysis).	The RETRAN3D analysis applies a multiplication factor of one using decay heat data for U235, Pu239 and U238 and includes contribution to decay heat from U239 and NP239. The resulting decay heat bounds the decay heat presented on Table 6.2.1.36 of the UFSAR used for containment peak pressure analysis. The RETRAN3D analysis calculates the steam generator makeup required for the at power event to the point where pressurizer level is restored and the plant is in a stable condition.
3.2.1.4.A	Confirmatory Item: Confirm that the key initial plant parameters and assumptions used in the forthcoming RETRAN3D analysis are consistent with the appropriate values from NEI 1206, Section 3.2, or justify any deviations.	The RETRAN3D analysis conforms to the requirements stated in Section 3.2.1.2 of NEI 12-06, Rev 0.

Identifying Number	Question/Request	STP Response
3.2.1.5.A	Confirmatory Item: In response to a concern regarding the survivability of critical instrumentation in an adverse containment atmosphere, the licensee provided details of the containment analysis being used at STP. Resolution of the concern regarding survivability and proper function of containment instrumentation is dependent on results of the containment analysis.	NAI-1786-001 Rev. 0 (STI 33945544) is the Containment Analysis for ELAP event. This calculation confirms that neither containment nor its instrumentation are challenged when an ELAP and the subsequent loss of coolant occurs from at power conditions.
3.2.1.5.B	Confirmatory Item: Provide adequate justification that the RCS wide range pressure indication would not be influenced by containment conditions to an extent that would affect a reliable determination of nitrogen injection from the cold leg accumulators.	The RCS wide range pressure indication will not be used in the determination of nitrogen injection into the RCS. Instead, steam generator pressure will be used consistent with the PWROG recommendations. The uncertainty associated with containment conditions has been factored into the steam generator pressure setpoint consistent with the guidance provided by the PWROG. See PWROG EOP ECA0.0.
3.2.1.8.A	Confirmatory Item: The licensee should either (1) confirm that it will abide by the NRC staff discussion on boric acid mixing under two-phase natural circulation flow conditions, or (2) identify another acceptable method for ensuring that the boric acid necessary to achieve adequate shutdown margin to mitigate an ELAP event will be adequately mixed with the reactor coolant system volume under two-phase natural circulation flow conditions..	Provided in STPs "White Paper Demonstrating the Applicability Of The RETRAN3D Code For Analysis Of The ELAP". A.1 Boron Transport Model (SER Condition #3). NRC staff position is that the boron transport model in RETRAN3D is approved for use, with the caveat that its diffusive nature should not be allowed to produce misleading results (Rev. [2] pg 14). In this context, "diffusive" refers, for example, to the tendency to "wash out" or attenuate pulses or step changes in boron concentration. A simple example occurs when an accumulator suddenly injects into the system. A local pulse/step in boron concentration is expected, and this pulse should propagate around the system, eventually returning to its origination point. Along the way, it is physically expected that the pulse will be attenuated by mixing in various plenums. Additional nonphysical attenuation will occur due to numerical diffusion. The net effect is that the pulse will become flattened and broadened. The nonphysical portion of the attenuation will cause the leading edge of the pulse to appear earlier than physically expected.

Identifying Number	Question/Request	STP Response
3.2.1.8.A (continued)	Confirmatory Item: The licensee should either (1) confirm that it will abide by the NRC staff discussion on boric acid mixing under two-phase natural circulation flow conditions, or (2) identify another acceptable method for ensuring that the boric acid necessary to achieve adequate shutdown margin to mitigate an ELAP event will be adequately mixed with the reactor coolant system volume under two-phase natural circulation flow conditions..	If this change in timing is important, or if the "excess" attenuation is important, then misleading conclusions may occur. In the ELAP scenario, the total natural circulation flow is approximately 2,000 lbm/sec, the total RCS mass is approximately 600,000 lbm, which implies a loop circulation time of approximately 300 seconds, or 12 loop circulationsin one hour. After a few circuits around the system, any boron concentration pulse/step will be washed out by plenum mixing, andeventually the boron will be mixed uniformly around the system. This uniformity will occur with or without numerical diffusion; diffusion simply accelerates the effect. Using the guidance provided in the NRC memo dated January 8, 2014 and restated in Section 1.7, not taking credit for boron until one hour after the target boron concentration is reached while two phase flow is greater than single phase flow will ensure that the diffusive nature of the boron transport model will not produce misleading results. Therefore, the use of the boron transport model in RETRAN-3D satisfies the SER Condition #3 for ELAP analysis in PWRs. Update: Limitation 1.3.3 of the RETRAN3D White Paper (See Open Item 3.2.1.1.A) places the restriction on boron mixing that abides by the NRC staff discussion on boric acid mixing under two-phase natural circulation flow conditions. The plant specific analysis abides by this restriction.
3.2.1.8.B	*Confirmatory Item: Complete shutdown margin analysis for* STP and demonstration of adequate shutdown margin during an ELAP event.	See response to 3.2.1.8.D.

Identifying Number	Question/Request	STP Response
3.2.1.8.C	Confirmatory Item: Provide adequate basis that the core xenon concentration would remain above its equilibrium value for at least23 hours post-trip.	A review of the Nuclear Design Reports for several representative fuel cycles shows that xenon worth remains above the equilibrium value between 20 and 25 hours for beginning of life and end of life conditions and between 18 and 20 hours for middle of life conditions. The addition of boron from the FLEX pumps expected to occur in less than 10 hours which will provide the boron to ensure the reactor core does not become critical. As an additional barrier, the Emergency Operating Procedures direct the operators to perform alternate RCS boration within 17 hours of the initiation of the ELAP event, which allows a one hour operator action time to perform this evolution.
3.2.1.8.D	Confirmatory Item: Confirm that shutdown margin requirements for future operating cycles remain bounded by the calculation for Unit 1, Cycle 14.	A fuel cycle specific curve of the boron requirements versus RCS temperature for various fuel burnup similar to Figure 5.8.11 in WCAP 17601-P was developed. These curves are used as part of the STP reload safety evaluation process to ensure sufficient shutdown margins will be maintained and Unit 1, Cycle 14 remains bounding.
3.2.1.9.B	Confirmatory Item: The licensee stated during the audit response "all these N pumps will be pre-staged in Category 1 structures, protected from all external events." However, the licensee has previously stated that the storage of the trailer mounted diesel driven pumps was in non-Category 1 building physically separated to assure survivability of at least one pump. Confirm resolution of the apparent conflict.	The TMDDPs do not perform primary safety functions to protect the core, the spent fuel, or containment. They are used as support equipment. These pumps are stored in metal buildings that meet NEI 12-06 structural requirements.

Identifying Number	Question/Request	STP Response
3.2.1.9.C	Confirmatory Item: The licensee stated that the FLEX pumps have been sized and deployment time determined to ensure that (1) reflux cooling will not occur, (2) the RCS makeup flow will exceed the RCP seal leak-off and be able to restore pressurizer water level, (3) provide sufficient boron to prevent a return to power and (4) to remove decay heat. The ability of these pumps to provide sufficient makeup flow in the required time frame will be demonstrated by plant specific analyses, scheduled to be completed by the end of the year.	Analyses complete.
3.2.1.9.E	Confirmatory Item: Identify the minimum steam requirements to support TDAFW operation and justify that the TDAFW pump can perform its function until FLEX pumps can be placed into operation.	The TDAFW pump is designed to operate at steam pressures greater than 110 psig. The emergency operating procedure (0POP05-E0-EC00) will direct the operators to depressurize the steam generator to 405 psig, thus ensuring sufficient steam pressure to the TDAFW pump. This pressure will be maintained until the FLEX secondary pumps are made available. In the event sufficient steam pressure cannot be maintained due to low decay heat, the emergency operating procedures directs the operators to implement the FLEX secondary makeup pump (0POP12-ZO-FSG03).
3.2.1.A	Confirmatory Item: Confirm that the analysis for preventing nitrogen injection from the accumulators will use the methodology in Attachment 1 to the Pressurized Water Reactor Owners Group (PWROG) interim core cooling position paper ("PWROG Core Cooling Position Paper,") Revision 0, November 2012, PAPSC0965; (withheld from the public for proprietary reasons) or specify an alternate method for preventing nitrogen injection and demonstrate its acceptability.	The methodology used to ensure that nitrogen injection from the accumulators used in the RETRAN-3D analysis complies with the methodology developed by the PWROG.

Identifying Number	Question/Request	STP Response
3.2.1.B	Confirmatory Item: Confirm (1) that remote operation of the SG PORVs will be implemented in a manner that will conserve the available hydraulic pressure such that the PORVs can be remotely operated to the extent necessary to perform the cooldown called for in the integrated plan without local actions, (2) that local manual actions can be taken to increase the hydraulic pressure to permit further remote operation of the PORVs consistent with the integrated plan or (3) that direct local operation of the PORVs can be accomplished consistent with the integrated plan..	EC00 and/or the FSG that contains the RCS cooldown tell the operators the approximate value to open the SG PORVs (10%). This will conserve the hydraulic pressure for extended remote operation. Plant operators are trained and have procedural direction (existing site procedures) to locally operate the SG PORVs including during an ELAP. A manual hydraulic pump used for manual pressing up of the SG PORV hydraulic pressure is located in the Turbine Generator Building. Because this location is not protected from all external events, an additional pump will be stored inside the Power Block, protected from all external events. Procedural guidance is provided in the appropriate FSGs for this operation.
3.2.2.A	Confirmatory Item: On page 41 of the Integrated Plan, in the section discussing the SFP cooling for Phase 3 using the portable SFP pump, the licensee stated that a pre-staged FLEX SFP fill pump will be attached to the emergency core cooling system in a manner still to be determined. The licensee later stated that the FLEX modification design packages are scheduled for completion in May of 2014. Confirm SFP fill pump configuration.	Design Change Package 12-11658-30 and associated Design Change Notices document the piping modification for the suction of the SFP fill pump. The suction piping will come off of the containment spray 2B suction piping. Clarification Update: The discharge is hard-piped from the 129' elevation of the Fuel Handling Building (FHB) to the 68' elevation of the FHB, very close to the spent fuel pool.
3.2.3.A	Confirmatory Item: The licensee stated that a site specific containment analysis is being performed to ensure that containment integrity is not challenged by the energy release resulting from the ELAP event and, that environmental effects on equipment located inside containment relied upon to mitigate the ELAP event, will not result in this equipment failing to perform its intended function. The licensee also stated that the purpose of the containment analysis is to ensure that containment integrity is not challenged by the energy release resulting from the ELAP event. Confirm completion of this analysis.	Preliminary analysis using the GOTHIC computer code (NAI-1786-001) demonstrates that the containment pressures and temperature remain well below design and equipment qualification limits. The analysis is based on the mass and energy releases from the RETRAN3D computer code that use a reactor coolant pump seal leakage model that is still under review by the NRC staff. Upon resolution of the reactor coolant pump seal leakage model issue, the GOTHIC analysis will be revisited to ensure that containment pressure and temperatures limits are not exceeded.

Identifying Number	Question/Request	STP Response
3.2.4.10.A	Confirmatory Item: Confirm how long batteries will be relied upon during the mitigation strategies before charging is initiated and justify that the batteries are capable of supporting load for that duration. For duration greater than 8 hours, and acceptable method is provided in NEI position paper entitled "Battery Life Issue" and the NRC endorsement (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML13241A186 and ML13241A188).	The Phase 2 Staffing Assessment includes performance of the additional DC load shed within two hours as required by the battery study, therefore credit can be taken for the batteries performing as indicated in the study. The FLEX DG will be started at the 2.5 hour mark and the A & C train battery chargers will begin charging the batteries at the 4 hour mark providing ample margin for starting to charge the batteries within 8 hours.
3.2.4.10.B	Confirmatory Item: Provide the results of the additional load shedding evaluation needed to extend the Class 1E battery life that will be incorporated into the FLEX support guideline. Include a discussion on remedial measures required for de-energizing of additional loads.	Plant Operations has procedures for the de-energizing of every AC and DC electrical bus. This additional load shedding has already been identified and can be easily referenced in these procedures. There will be no remedial measures based solely on de-energizing these additional loads. With all AC power lost, no fans or pumps will be running so failure closed of AOVs or dampers will not adversely affect equipment.
3.2.4.3.A	Confirmatory Item: There was no discussion in the Integrated Plan regarding the need for heat tracing in lines with borated coolant, and if necessary, how the heat tracing would be powered. Provide clarification of the need for heating to prevent boric acid precipitation for a duration sufficient to support the actions in the integrated plan, and power sources for the heaters.	Heat trace circuits normally maintain the 4 weight percent boric acid at approximately 85°F. When the ELAP occurs, the water temperature will slowly lower but will not reach 55°F because the tanks and piping are insulated and inside concrete buildings. When the FLEX DG is running, the Boric Acid pumps will be started (hour 8-10) and will recirculate the Boric Acid Tanks (BATs) to ensure the temperature does not continue to lower where saturation could become an issue. By approximately hour 15, it will no longer be necessary to take suction from the BATs suction will be transferred to the Reactor Water Storage Tank (RWST) which has a much lower boron concentration. In the very unlikely event that the boric acid did begin to solidify early, this suction source transfer (from BATs to RWST) can take place at any time because the pumps can take suction on either source at any time.

Identifying Number	Question/Request	STP Response
3.2.4.8.A	Confirmatory Item: The licensee has identified the use of temporary 480 VAC FLEX power but there was no information regarding the technical analyses performed as the basis for the size and configuration of the generator and distribution system for Phase 2 or Phase 3. The licensee addressed this concern during the audit process and stated that the FLEX diesel generator sizing calculation was expected to be completed by the end of 2013. Confirm completion of the calculation and that the calculation supports the size and configuration of the generator and distribution for Phase 2 and/or Phase 3.	See Audit Question #60 for DG sizing calculation. Drawing 00001E0FRAA shows configuration of DGs and the distribution system.
3.2.4.8.C	Confirmatory Item: Confirm that procedures and breaker design will provide isolation and protection when aligning the backup DGs and when restoring normal power.	FSG-05 and FSG-13 provide adequate isolation and protection for both installing and removing FLEX power from the plant.
3.2.4.8.D	Confirmatory Item: Confirm that the FLEX generator instrumentation utilized in monitoring equipment operation, has appropriate tolerances accuracies to assure proper operation of the equipment to support the strategies.	The accuracy and resolution values for the FLEX generator instrumentation are provided below: Current (A, kA) +/ 2% +/ 0.5 digit Voltage (V) +/ 1.5% +/ 0.5 digit Energy (kWh, MWh, GWh) +/ 3.5% +/ 0.5 digit Real power (kW, MW) +/ 3.5% +/ 0.5 digit Total power (kVA, MVA) +/ 3.5% +/ 0.5 digit Frequency (Hz) +/ 1 Hz +/ 1 Hz Time delay (sec) +/ 1 sec +/ 1 sec

Identifying Number	Question/Request	STP Response
3.2.4.9.A	Confirmatory Item: Confirm proper quality of fuel oil for FLEX strategy usage.	Ultra-Low Sulfur Diesel (ULSD; Sulfur content <15 ppm) is currently the only standard type of commercial diesel fuel available and the fuel available through STP's fuel tanks. New engines are designed for use of ULSD and Tier 4 emission engines require it. Legacy engines and those produced using Tier 13 standards may run it with only minimal impacts. The engine models we have are the John Deere 6068H (part of Gorman-Rupp Model PA6B60606H) and the MTU 1000XC6DT2 Gen Set. These are both listed as Tier 2 engines per manufacturing documentation and are designed to use ULSD from the factory.
3.3.1A	Confirmatory Item: The lack of a means to deploy the diesel driven trailer mounted pump, relied upon as a backup SG makeup pump, during a design basis flood during the first 72 hours renders it unavailable to support mitigating strategy functions. Confirm that appropriate equipment unavailability controls will be used for the primary capability for performance of this function (i.e., the RCS Core Cooling FLEX Pump).	The diesel-driven pumps are no longer part of the SG makeup (i.e. Core Cooling) strategy.
3.1.2.2.A	Open Item: The licensee does not provide for transportation/deployment of the diesel-driven trailer-mounted pumps relied upon as a spare SG makeup pump in the event of a design basis flood.	The TMDDPs are no longer part of the SG fill strategy. The strategy for the +1 Core Cooling (SG Makeup) pump has been changed. STP plans to purchase and install a pump identical to the N pump to perform this function. This second SG Makeup pump will be installed in a different bay/train than the N pump in the same protected safety related building. With this change in strategy, STPNOC considers this deployment issue closed.

Identifying Number	Question/Request	STP Response
3.2.1.1.A	Open Item: Demonstrate the applicability of the RETRAN-3Dcode for analysis of ELAP transient	STP provided a revised RETRAN-3D white paper to the NRC via email on 10/8/14. Also included was a rack-up of the NRC staff comments and their resolution.
3.2.1.1.B	Open Item: Provide analysis of the ELAP transient that is applicable to STP and which demonstrates the adequacy of the mitigating strategy proposed for STP. This includes specification of an acceptable definition for the transition to reflux condensation cooling to ensure that the analysis is not credited beyond this juncture. A sufficient number of cases should be included in the analysis to demonstrate the acceptability of different strategies that may be necessary to mitigate an ELAP (e.g., as discussed in Section 3.2.1.6, in some cases "N" and "N+1" pumps have different capabilities, which may substantially affect the sequence of events in the integrated plan).	STP has preliminary results using the RETRAN-3D code. Results will be provided to the NRC once all comments from the white paper submitted for OI#3.2.1.1A have been incorporated. See Response to OI 3.2.1.1A - Revised white paper submitted 10/8/14.
3.2.1.6.A	Open Item: Develop the final timeline(s) and sequence(s) of events for STP.	Sequence of Events timeline is complete and has been provided to the NRC review team.

Identifying Number	Question/Request	STP Response
3.2.4.8.B	Open Item: Electric Power Sources - On page 20 of the Integrated Plan, the licensee stated the strategy for mitigating an ELAP is to use a 480 VAC air cooled diesel generator on top of roof of the MAB to provide power to an electric driven SG FLEX pump, a RCS FLEX pump and a spent fuel pool FLEX pump. The use of pre-staged generators appears to be an alternative to NEI 12-06. The licensee has not provided sufficient information to demonstrate that the approach meets the NEI 12-06 provisions for pre-staged portable equipment. Additional information is needed from the licensee to determine whether the proposed approach provides an equivalent level of flexibility for responding to an undefined event as would be provided through conformance with NEI 12-06.	Pre-staging the two FLEX DGs is necessary because of the postulated flood caused by a breach of the reservoir embankment (Reference UFSAR Section 3.4.1.1). Although this event is not considered credible, another flooding scenario due to upstream dam failure has the potential of inundating the site with several feet of water. Staging and storing the FLEX diesels on the MAB roof would provide reasonable protection from either flooding event. NEI 12-06 Section 11.3.2 states that the mitigation strategy and support equipment will be reasonably protected from applicable external events such that the equipment could be operated in place. Use of the existing electrical distribution system also conforms to the requirements of NEI12-06. Section 3.2.1.3, Item (8) states that installed electrical distribution systems, including inverters and battery chargers, remain available provided they are protected consistent with current station design. The electrical paths for energizing the FLEX equipment will be diverse in that the currently installed equipment will be repowered via Class 1E motor control centers (MCCs) and the new FLEX pumps will be powered via new cabling to the new pumps. Item (9) of Section 3.2.1.3 states that no additional events or failures are assumed to occur immediately prior to or during the event. As stated in Section 8.1.4.2 of the STP UFSAR, the Class 1E Electrical System is designed to withstand the effects of design basis natural phenomena, assuming single active failure, without loss of onsite power to those safety-related electrical components required to shut down the plant and maintain it in a safe condition or to mitigate the consequences of postulated accidents. The two pre-staged 480VAC 1000kW DGs are capable of providing the protection called for in the Order.

Identifying Number	Question/Request	STP Response
3.2.4.8.B (continued)	Open Item: Electric Power Sources - On page 20 of the Integrated Plan, the licensee stated the strategy for mitigating an ELAP is to use a 480 VAC air cooled diesel generator on top of roof of the MAB to provide power to an electric driven SG FLEX pump, a RCS FLEX pump and a spent fuel pool FLEX pump. The use of pre-staged generators appears to be an alternative to NEI 12-06. The licensee has not provided sufficient information to demonstrate that the approach meets the NEI 12-06 provisions for pre-staged portable equipment. Additional information is needed from the licensee to determine whether the proposed approach provides an equivalent level of flexibility for responding to an undefined event as would be provided through conformance with NEI 12-06.	New cables will be run from a new FLEX distribution panel located near the new FLEX DGs either through existing electrical system pathways (cable trays) or through conduits that meet the requirements associated with initial plant construction standards. The FLEX equipment being powered from the FLEX diesel that will be used in Phase 2 of the FLEX strategy is contained in Category I structures and protected from external events. Cabling provides power to Class 1E MCCs so that other components can be powered to provide a variety of functions including battery charging, pumping, ventilation, lighting and communications. The new and previously installed cables that will be used for the FLEX strategies will be protected from all external events as described in NEI 12-06 as will the MCCs and the pre-staged pumps. Diversity for this strategy exists: • The FLEX DGs are 100% capacity, only one is required. • The FLEX distribution panel feeds three completely separate and independent "trains" of ESF electrical equipment. These are separated on three different elevations in the Electrical Auxiliary Building (EAB) and power like components on different trains. • Specific FLEX cables go directly to the new FLEX pumps without utilizing the "trains" of ESF electrical equipment. • Each safety function strategy has both a permanent plant pump and a new FLEX pump with diverse power distribution. Flexibility for this strategy exists: The FLEX cabling being run from the FLEX DGs to power ESF motor control centers for powering battery chargers, pumps, lighting, valves and other equipment can be modified to run to multiple motor control centers (MCC) to power redundant equipment in the event of a fire or disturbance to one particular "train" of ESF electrical power.

Identifying Number	Question/Request	STP Response
3.2.4.8.B (continued)	Open Item: Electric Power Sources - On page 20 of the Integrated Plan, the licensee stated the strategy for mitigating an ELAP is to use a 480 VAC air cooled diesel generator on top of roof of the MAB to provide power to an electric driven SG FLEX pump, a RCS FLEX pump and a spent fuel pool FLEX pump. The use of pre-staged generators appears to be an alternative to NEI 12-06. The licensee has not provided sufficient information to demonstrate that the approach meets the NEI 12-06 provisions for pre-staged portable equipment. Additional information is needed from the licensee to determine whether the proposed approach provides an equivalent level of flexibility for responding to an undefined event as would be provided through conformance with NEI 12-06.	An example would be the Boric Acid Transfer pump B is powered from the train 'A' MCC and the Boric Acid Transfer pump A is powered from train 'C' MCC. The Reactor Makeup Water pumps are powered similarly. Thus if something disturbed the 10' elevation of the EAB electrical switchgear room where the 'A' train electrical equipment is located, the 'C' train electrical equipment should not be affected because it is on the 60' elevation of the EAB. For this reason, there is capability to adapt to different scenarios. Section 3.2.1.3(6) of NEI 12-06 states that permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, high winds and associated missiles are available. Section 3.2.1.7 states that the priority for the plant response is to utilize systems or equipment that provides the highest probability for success. The STP strategies that include pre-staged FLEX diesel generators and use permanent plant equipment provide the highest probability of success.

ATTACHMENT 2

Update to Response to Open and Pending Items from the FLEX and SFPLI Audit Report

STPNOC provided responses to the Open and Pending items identified in the FLEX/SFPI Onsite Audit Report issued by the NRC (Reference 5) with STP's Order Compliance letter (Reference 2) for Unit 2.

STPNOC has responded to all of the follow-up questions asked by the NRC regarding RCP seals. At this time, no further work is required to validate that STP Units 1 and 2 are in compliance with Order EA-12-049 relative to RCP seal behavior and Westinghouse ELAP analyses. STP will continue to monitor the discussions between the PWROG and the NRC regarding these issues.

ATTACHMENT 3

Summary of Responses for Other Issues that Arose after the Audit Report

The NRC asked STP to respond to two questions regarding the FLEX strategies since the issuance of the STP Onsite Audit Report. The first involved the performance of Westinghouse-style RCP seals under Extended Loss of AC Power (ELAP) conditions. The second involved the seismic surviveability of the FLEX storage buildings not designed to withstand the plant site's Safe-Shutdown Earthquake (SSE). STP's responses to these two questions are included below.

NRC Question – Plants with Westinghouse-Style Seals and with Mitigation Strategy Safety Evaluations (SEs) Outstanding

The NRC asked STP the following question in August 2015 and requested that STP provide the site specific information in the table provided on the following page.

Background: Based on a series of interactions with the PWROG, a number of issues associated with the performance of Westinghouse-style RCP seals under ELAP conditions have been resolved. However, at present, several key issues remain unresolved, and it appears that the PWROG may not be able to resolve them fully on a timescale consistent with the Mitigation Strategies Order. These issues include (1) the potential for 1st-stage seal leakoff line overpressurization, (2) vendor recommendations for an extended cooldown to ensure second-stage seal integrity (see Westinghouse Technical Bulletin 15-1), and (3) the potential for earlier initiation of the RCS cooldown and RCS makeup in light of unexpected leakage rate increases with time during the recent AREVA Karlstein tests.

STP Response

STP's site specific information was provided to the NRC in the form of the table on the following page. The information contained in this table was derived from calculation STP-CP-006 (Reference 22).

The table contains revised values for STP and includes additional clarifying notes were added to explain the changes.

Plant	Seal Leakoff Line Category	No.1 Seal Leakoff Line Max Pressure Limit (psia)(1) (Default Value >= 2500 psia)	Extended Cooldown for #2 Seal Integrity per TB 15-1(2)		Time to Initiate RCS Cooldown (hrs) (Default Value <= 2 hrs)	Currently Planned Time for RCS Makeup (hrs) (Default Value <= 8 hrs)	Previous understanding of Planned Time for RCS Makeup (hrs)	Approx. Need Time for RCS Makeup (hrs)	Notes
			Cooldown Temp (Default Value <= 350 °F)	Cooldown Time (hrs) (Default Value <= 24 hrs)					
South Texas	6	2500(3)	450°F	< 4	1	10	10	11.3(4) 15.9(5)	Both units have AREVA-manufactured seals installed. Understand can tolerate > 2500 psia

(1) Refers to seal leakoff line maximum tolerable internal pressure for piping and components inclusive of the flow measurement orifice.
(2) STP initiates a second cooldown at 10 hours to reduce the RCS temperature to below 350ºF approximately 12 hours into the event.
(3) See Condition Report Engineering Evaluation (CREE) 15-15223-3. The remaining values in the table are documented in STP calculation STP-CP-006 (Reference 22).
(4) Time at which two-phase flow through RCP seals could occur.
(5) Onset of reflux cooling

NRC Question – FLEX Storage Building Design

Regarding the seismic design of the two STP FLEX storage buildings, if the buildings are not designed to a level commensurate with the plant SSE, provide justification that the equipment necessary to mitigate a beyond-design basis seismic event under the conditions of Order EA-12-049 can be deployed successfully. This could be demonstrated by one of the following means:

1. Evaluate the storage buildings to the SSE level and demonstrate its performance is adequate to support fulfillment of the strategies (e.g. does it collapse, fail major/minor structural members, skew doorframes, etc.)
2. Show that there is another load case (such as wind loading) which governs the building design such that the building would be functional following an SSE.
3. Show that the equipment stored in the building is not essential for the strategies to succeed following a seismic event. (This may be applicable to sites who rely heavily on pre-staged FLEX equipment already in other protected buildings.)
4. Show that the reevaluated GMRS [Ground Motion Response Spectrum] seismic hazard is equivalent to or enveloped by the ASCE 7-10 spectra which was used to design the building.

STP Response – FLEX Storage Building Design

STP developed a Condition Report Engineering Evaluation (CREE) in response to this NRC question. CREE 12-11658-741 has been provided electronically via the IMS portal and is discussed in Section 3.7 of the FIP, "Protection of FLEX Equipment" (Attachment 4).

The CREE confirmed that the wind forces used in the design significantly exceed SSE seismic forces. This is a consequence of the relatively low mass of the one-story buildings, the low seismicity of the Texas Gulf Coast region, and the relatively high wind forces required by ASCE 7-10 in this region. The engineering evaluation estimated SSE seismic forces using the static equivalent method of seismic analysis and 1.5 times SSE peak acceleration. Therefore, even though SSE was not used in the design of the buildings, the higher wind forces that were used guarantee that the buildings will survive the STP design basis SSE earthquake.

ATTACHMENT 4

STP FLEX Final Integrated Plan (FIP)

Docket Nos. 50-498/499
Order EA-12-049

FINAL INTEGRATED PLAN

Beyond Design Basis
FLEX Mitigation Strategies

STP Nuclear Operating Company

Table of Contents

List of Tables

List of Figures

List of Acronyms

AC – Alternating Current

AFW – Auxiliary Feedwater

AFWST – Auxiliary Feedwater Storage Tank

AOV – Air Operated Valve

ATWS – Anticipated Transient Without Scram

BAT – Boric Acid Tank

BDB – Beyond-Design-Basis

BDBEE – Beyond-Design-Basis External Event

CCW – Component Cooling Water

CVCS – Chemical and Volume Control System

DA – Deaerator

DC – Direct Current

DCP – Design Change Package

DG – Diesel Generator

DWST – Demineralized Water Storage Tank

ECP – Essential Cooling Pond

ECW – Essential Cooling Water

ELAP – Extended Loss of AC Power

EOP – Emergency Operating Procedure

ESF – Engineered Safety Feature

FHB – Fuel Handling Building

FIP – Final Integrated Plan

FLEX – Diverse and Flexible Coping Strategies

FR – Fukushima Response

FSG – FLEX Support Guideline

GMRS – Ground Motion Response Spectrum

HHSI – High Head Safety Injection

LLRW - Low Level Radwaste Building

LOOP – Loss of Offsite Power

LUHS - Loss of Normal Access to the Ultimate Heat Sink

MAB – Mechanical Auxiliary Building

MCC – Motor Control Center

MCR – Main Cooling Reservoir

MSL – Mean Sea Level

MSSV – Main Steam Safety Valve

MW – Megawatt

NEI – Nuclear Energy Institute

NRC – Nuclear Regulatory Commission

NSRC – National SAFER Response Center

NSSS – Nuclear Steam Supply System

NTTF – Near-Term Task Force

OBE – Operating Basis Earthquake

OE – Operating Experience

OIP – Overall Integrated Plan

PA – Protected Area

PDP – Positive Displacement Pump

PEICo – Pooled Equipment Inventory Company

PORV – Power Operated Relief Valve

PRT – Pressurizer Relief Tank

PRV – Pressure Relief Valve

PWROG – Pressurized Water Reactor Owner's Group

QDPS – Qualified Display Processing System

RCFC – Reactor Containment Fan Cooler

RCP – Reactor Coolant Pump

RCS – Reactor Coolant System

RMW – Reactor Makeup Water

RMWST – Reactor Makeup Water Storage Tank

RVWL – Reactor Vessel Water Level

RWST – Refueling Water Storage Tank

SAFER – Strategic Alliance for Emergency Response

SBO – Station Blackout

SFP – Spent Fuel Pool

SI – Safety Injection

SMUT – Secondary Makeup Tank

SPID – Screening, Prioritization and Implementation Details

SSE – Safe Shutdown Earthquake

STP – South Texas Project

STPEGS – South Texas Project Electric Generating Station

STPNOC – South Texas Project Nuclear Operating Company

TDAFW Pump – Turbine-Driven Auxiliary Feedwater Pump

TMDDP – Trailer-Mounted Diesel-Driven Pump

TRM – Technical Requirements Manual

TS – Technical Specification

TSC – Technical Support Center

UHS – Ultimate Heat Sink

WR – Wide Range

1. Introduction

This Final Integrated Plan (FIP) defines strategies capable of mitigating a simultaneous loss of all alternating current (AC) power and loss of normal access to the ultimate heat sink (UHS) resulting from a Beyond-Design-Basis External Event (BDBEE). These strategies provide adequate capability to maintain or restore core cooling and inventory as well as containment and Spent Fuel Pool (SFP) cooling capabilities for both STP Unit 1 and STP Unit 2. The inability to anticipate all possible scenarios involving a BDBEE necessitates that the strategies are also diverse and flexible to encompass a wide range of possible conditions to protect the public health and safety. The impact of these strategies on the design basis capabilities of the units have been evaluated under 10 CFR 50.59.

2. Background

In 2011, an earthquake-induced tsunami caused Beyond-Design-Basis (BDB) flooding at the Fukushima Dai-ichi Nuclear Power Station in Japan. The flooding caused the emergency power supplies and electrical distribution systems to be inoperable, resulting in an extended loss of AC power (ELAP) in five of the six units on the site. The ELAP led to the loss of core cooling, loss of spent fuel pool cooling capabilities and a significant challenge to maintaining containment integrity. All direct current (DC) power was lost early in the event at Units 1 and 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.

Following this event, 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 (Reference 1) contained many recommendations to fulfill this charter, including assessing extreme external event hazards and strengthening station capabilities for responding to BDBEEs.

Based on NTTF Recommendation 4.2, the NRC issued Order EA-12-049 (Reference 2) requiring licensees to implement mitigation strategies for BDBEEs including the following requirements:

- Licensees shall develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a BDBEE.
- Licensees shall develop strategies that are capable of mitigating a simultaneous loss of all AC power and loss of normal access to the ultimate heat sink (LUHS) and have adequate capacity to address challenges to core cooling, containment and SFP cooling capabilities at all units on a site.

- 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.
- Licensees must be capable of implementing the strategies in all modes.
- Full compliance shall include procedures, guidance, training, and acquisition, staging or installing of equipment needed for the strategies.

Order EA-12-049 specifies a three-phase approach for strategies to mitigate BDBEEs. The initial phase, "Phase 1", requires the use of installed equipment and resources to maintain or restore core cooling, containment and SFP cooling capabilities. The transition phase, "Phase 2", requires providing sufficient, portable, onsite equipment and consumables to maintain or restore these functions until resources can be brought from off site. The final phase, "Phase 3" requires obtaining sufficient offsite resources to sustain those functions indefinitely.

Order EA-12-049 also required licensees of operating reactors to submit an Overall Integrated Plan (OIP) that included a description of how compliance with these requirements would be achieved by February 28, 2013 (Reference 3), followed by status updates submitted at six-month intervals (References 4 - 8). The Order also requires licensees to complete implementation of the requirements no later than two refueling cycles after submittal of the OIP or by December 31, 2016, whichever comes first.

The Nuclear Energy Institute (NEI) developed NEI 12-06 (Reference 9) which provides guidelines for nuclear stations to assess extreme external event hazards and implement the mitigation strategies required by Order EA-12-049. The NRC issued Interim Staff Guidance JLD-ISG-2012-01 (Reference 10) endorsing NEI 12-06 with clarifications for determining baseline coping capability and equipment quality.

3. Diverse and Flexible Mitigation Capability (FLEX)

South Texas Project Nuclear Operating Company (STPNOC) has developed the following FLEX strategies to meet the requirements of Order EA-12-049.

3.1 General Elements - Assumptions

STPNOC established the following plant initial conditions, boundary conditions and assumptions consistent with NEI 12-06 for the purpose of defining FLEX strategies.

Boundary Conditions

- A BDBEE occurs impacting both units at the site.
- All reactors on-site initially operating at power, unless site has procedural direction to shut down due to the impending event.
- Each reactor is successfully shut down when required (i.e., all rods inserted, no ATWS).
- On-site staff are at site administrative minimum shift staffing levels.
- No independent, concurrent events, e.g., no active security threat.
- All personnel on-site are available to support site response.
- Spent fuel in dry storage is outside the scope of FLEX.

Initial Conditions

- Prior to the event the reactors have been operating at 100 percent rated thermal power for at least 100 days or have been shut down as required by plant procedures in advance of the impending event.
- The reactor and supporting plant equipment are operating within normal ranges for pressure, temperature and water level, or are available to operate from the standby state as described in the site design and licensing basis.
- The initiating event is not specific. The initial condition is assumed to be a loss of offsite power (LOOP) affecting both units on the site with no prospect for recovery for an extended period.
- All installed sources of emergency onsite AC power and station blackout (SBO) Alternate AC power sources are not available and not imminently recoverable.
- Cooling and makeup water inventories contained in systems or structures that are robust with respect to seismic events, floods, high winds and associated missiles are available.

- Normal access to the UHS is lost, but the water inventory in the UHS remains available and robust piping connecting the UHS to plant systems remains intact. The motive force for UHS flow (i.e., pumps) is assumed to be lost with no prospect for recovery.
- Permanent plant equipment and fuel for FLEX equipment stored in structures that are robust with respect to seismic events, floods, high winds and associated missiles are available.
- Other equipment, such as portable AC power sources, portable back up DC power supplies, spare batteries, and equipment for 10 CFR 50.54(hh)(2), may be used provided it is reasonably protected from the applicable external hazards, has predetermined hookup strategies with appropriate procedural guidance and the equipment is stored in a relative close vicinity of the site.
- Installed electrical distribution systems, including inverters and battery chargers, remain available provided they are protected consistent with current station design.
- No additional events or failures occur immediately prior to or during the event, including security events.

  The portion of the fire protection system that is robust with respect to seismic events, floods, high winds and associated missiles is also available as a water source.

Reactor Transient Boundary Conditions

- Following the loss of all AC power, both reactors are successfully shut down when required (i.e., all rods inserted, no ATWS).
- Steam release to maintain decay heat removal upon shutdown functions normally, and Reactor Coolant System (RCS) overpressure protection valves respond normally, if required by plant conditions, and reseat.
- No independent failures, other than those causing the ELAP/LUHS event, are assumed to occur in the course of the transient.

Reactor Coolant Inventory Loss Assumptions

- Sources of expected reactor coolant inventory loss consist of normal system leakage from reactor coolant letdown flow (until isolated) and Reactor Coolant Pump (RCP) seal leak-off at a rate dependent on RCP seal design.

SFP Initial Conditions

- SFP boundaries and cooling system are intact, including the liner, gates, transfer canal and attached piping.
- Initial loss of SFP inventory from sloshing during a seismic event does not preclude access to the refueling deck around the pool.
- The SFP heat load is assumed to be the maximum design basis heat load.

3.2 FLEX Mitigation Strategy Overview

The objective of the FLEX strategies is to establish an indefinite coping capability in order to prevent damage to the fuel in the reactors, maintain the containment function and maintain cooling and prevent damage to fuel in the SFP using installed equipment, onsite portable and pre-staged FLEX equipment, and pre-staged offsite resources.

Indefinite coping capability is attained through the implementation of pre-determined 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 ELAP/LUHS event. The FLEX strategies are diverse and flexible to encompass a wide range of possible conditions.

This safety function-based approach is consistent with the existing site EOPs. FLEX strategies are implemented in support of the EOPs using the procedures developed for implementing the FLEX strategies, the FLEX Support Guidelines (FSGs).

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

- Phase 1 (Initial Phase) – Initially cope by relying on installed plant equipment and onsite resources.
- Phase 2 (Transition Phase) – Transition from installed plant equipment to onsite FLEX equipment.
- Phase 3 (Final Phase) – Obtain additional capability and redundancy from offsite equipment 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.

For the Phase 2 or Transition Phase coping actions, the STP FLEX strategies utilize mainly pre-staged equipment instead of portable equipment. This is primarily due to challenges presented by STPs design basis flooding event. The design basis flooding event from a breach of the Main Cooling Reservoir (MCR) embankment inundates the site with water therefore some types of strategies are not feasible (i.e. moving portable pumps from a storage location to the power block to pre-installed connections to the Steam Generators (SGs), the RCS and the SFP). This is considered an Alternate Approach to NEI 12-06.

Additional details regarding the MCR embankment breach scenario are included in Section 3.6.2, "External Flooding". Further details about all of STP's alternate approaches to the NEI 12-06 guidance are discussed in Section 3.5, "Alternate Approaches".

Narrative Summary of ELAP/LUHS Event Sequence

A timeline of the overall strategy is presented in Table 3.15-1. The RCS response events in the timeline are based on analysis assuming the RCP seal leakage presented in Westinghouse Report PWROG-14015-P (Reference 35).

Phase 1 begins when the ELAP occurs. The reactor trips with all control rods and shutdown rods inserted. The TDAFW pump begins to feed the D-Train SG within one minute of the start of the event. The steam generator safety relief valve provides the initial RCS temperature and pressure control. At four minutes into the event, the leakage from the #1 RCP seal increases to approximately 16.5 gpm. Within ten minutes, Operators are dispatched to restore steam generator PORV control to the Control Room and begin to cross-connect AFW flow from the TDAFW pump to the other three SGs (Reference 11). The #1 seal leak-off line containment isolation valve is also locally closed, resulting in the #1 RCP seal flow being diverted to the PRT through the #1 seal leak-off line (PSV-3200).

Thirty minutes into the event, Operators determine that an ELAP condition has occurred and perform the initial assessment of FLEX equipment staging in accordance with FSG-05 and commence DC load shed of the non-essential equipment in accordance with FSG-04 (References 22 and 30).

Forty minutes into the event, flow from the TDAFW pumps is provided to all four SGs. One hour into the event, Operators commence a depressurization of all four SGs to a target pressure of 405 psig to reduce RCP seal leakage. Approximately 75 minutes into the event, the pressure in the Pressurizer Relief Tank (PRT) exceeds the rupture disk design pressure, resulting in the flow from the #1 seal leak-off line being released into containment. The FLEX equipment lineups and connections begin within one to two hours. Two hours into the event, the DC load shed of non-essential equipment is completed.

Within three hours, the SGs are depressurized to 405 psig, which ensures nitrogen injection from the safety injection (SI) Accumulators into the RCS does not occur. During the depressurization of the SGs and subsequent cooldown of the RCS, the boron addition from the accumulators ensures the reactor remains sub-critical. After six hours, offsite personal resources begin to arrive onsite.

Phase 2 begins in less than eight hours when a FLEX diesel generator (DG) is started and power becomes available to the FLEX equipment. Within eight hours, the A and C battery chargers begin charging batteries. Within ten hours, power to the SI Accumulator isolation valves is made available and these valves are closed, ensuring nitrogen injection into the RCS does not occur. At this time, charging flow of 35 gpm to the RCS from the BAT or RWST using the PDP is assumed, which provides boron and RCS inventory makeup.

The FLEX steam generator (SG) makeup pump is available by this time to ensure Auxiliary Feedwater (AFW) flow is available in the event the SG pressure decreases to such a point the TDAFW pump can no longer be sustained. The SG Power-Operated Relief Valves (PORVs) are used to start a second depressurization of the SGs and cooldown and depressurization of the RCS.

The second SG depressurization results in a significant decrease in the #1 RCP seal leakage. The #1 RCP seal leak-off is terminated when the RCS pressure decreases below the #1 seal leak-off line relief valve reset pressure. As the RCS inventory is restored, the RCS pressure increases. The RCS pressure is maintained at a pressure that ensures that the #1 RCP seal leak-off line relief valve does not re-open, which occurs at approximately 15 hours using the reactor vessel upper head vents.

At approximately 21 hours into the event, the reactor vessel upper head is filled. Flow through the reactor vessel upper head vent valves continues for another 30 minutes to cool the metal in the upper head, if required. At approximately 22 hours into the event, the reactor vessel upper head vents are secured and the pressurizer PORV or reactor vessel upper head vents could be used to maintain RCS pressure below the #1 RCP seal leak-off line relief valve pressure. At approximately 23 hours into the event, pressurizer level is restored and the FLEX RCS makeup pump is secured.

During Phase 2, preparations are made to refill the AFWST. The TMDDP used to fill the AFWST could also be used to fill the RWST. At this point, the plant is in a stable condition. The containment pressure is less than 3 psig and containment temperature is less than 135°F. The spent fuel pool temperature is less than 212°F.

Phase 3 begins with the arrival of additional equipment from NSRC. Among this equipment are two 4160V turbine generators which can be connected to an Engineered Safety Feature (ESF) electrical bus.

3.2.1 Reactor Core Cooling Strategy

Reactor core cooling involves the removal of decay heat through the secondary side of the Nuclear Steam Supply System (NSSS) and maintaining sufficient RCS inventory to ensure the continuation of natural circulation in the primary side of the NSSS. The FLEX strategy for reactor core cooling and decay heat removal involves releasing steam from the SGs using the SG PORVs and the addition of a corresponding amount of AFW to the SGs via the Turbine-Driven AFW (TDAFW) pump. The Auxiliary Feedwater Storage Tank (AFWST) is the water supply to the TDAFW pump. Operator actions to verify, re-align and throttle AFW flow are required by STP procedure 0POP05-EO-EC00, "Loss of All AC Power" (Reference 11) during an ELAP/LUHS event to prevent SG dryout.

Per the EC00 procedure, Operators will initiate RCS cooldown within the first hour following a BDBEE that triggers an ELAP/LUHS event.

RCS makeup and boron addition will be initiated within 10 hours following a BDBEE to ensure natural circulation, reactivity control, and adequate boron mixing is maintained in the RCS. See Figure 3.2.1-1 and Figure 3.2.1-2, below, for a diagrams of the FLEX SG and FLEX RCS Makeup pathways.

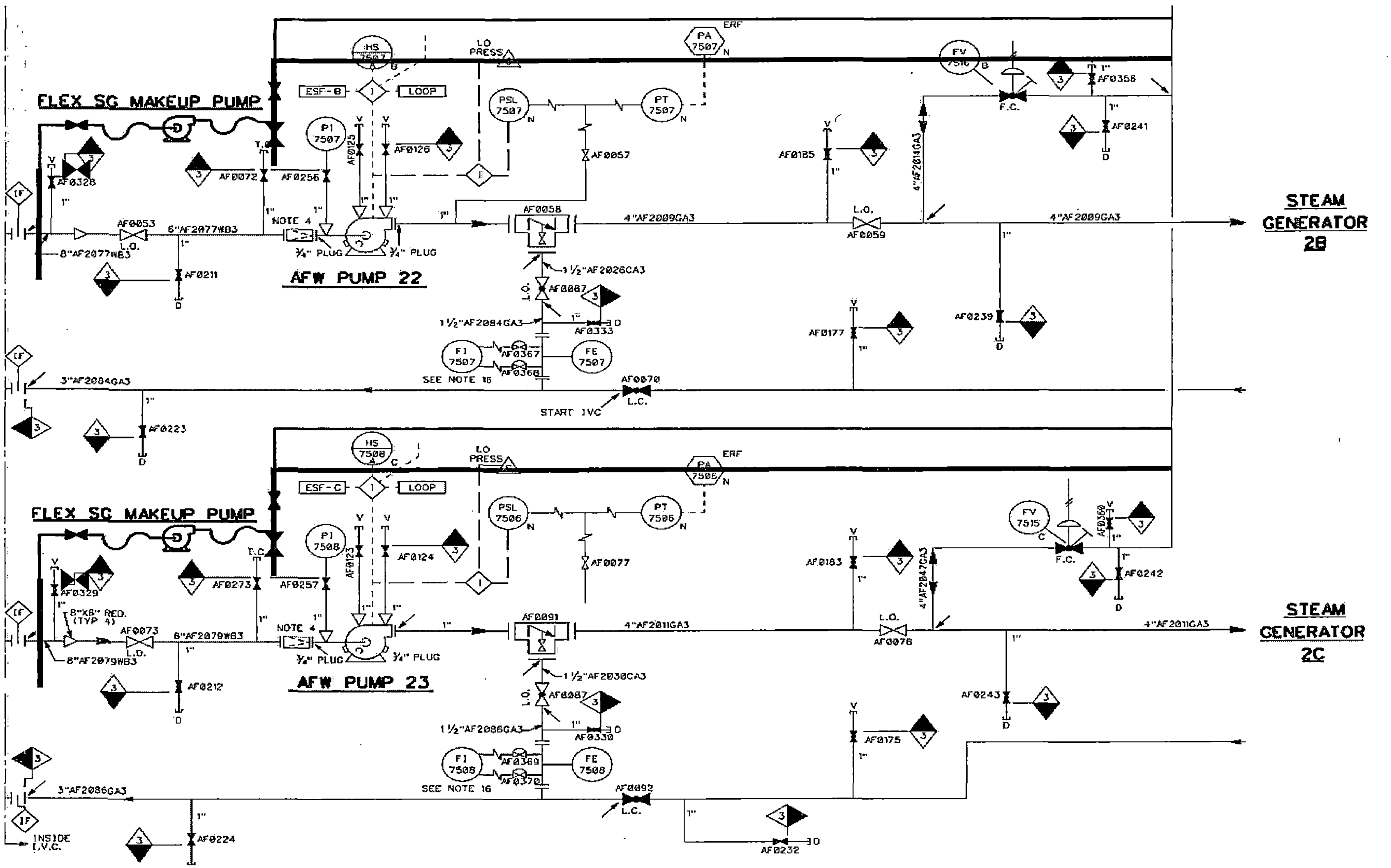

Figure 3.2.1-1 Diagram of Unit 2 FLEX SG Makeup Strategy

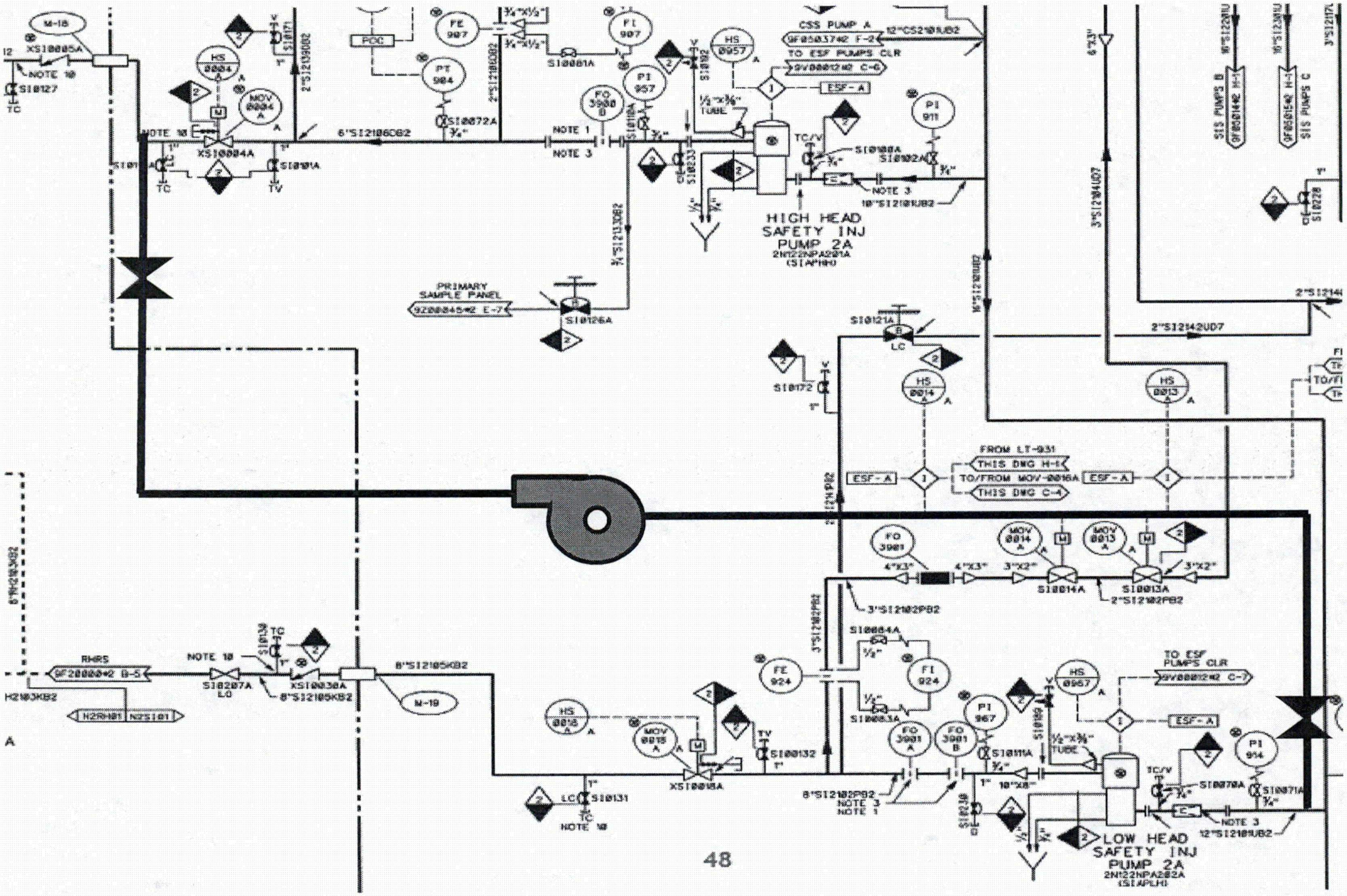

Figure 3.2.1-2 Diagram of Unit 2 FLEX RCS Makeup Strategy

The reactor core cooling strategies for Phases 1 through 3, described below, are the same for STP Unit 1 and Unit 2.

3.2.1.1 Phase 1 Strategy

The Phase 1 FLEX strategy for reactor core cooling and heat removal relies on installed plant equipment and water sources for supplying AFW flow to the SGs.

Operators will respond to the ELAP/LUHS event in accordance with the EOPs. Operators will transition to the EOP for loss of all AC power, 0POP05-EO-EC00 (Reference 11), when it is determined that all AC power has been lost. This procedure directs isolation of RCS letdown pathway, verification of containment isolation, reduction of DC loads on the station Class 1E batteries, and alignment of electrical equipment in preparation for eventual power restoration. Following an ELAP/LUHS event, the reactor will trip and the plant will initially stabilize at an average RCS temperature of approximately 582°F, with reactor decay heat removal via steam release to the atmosphere through the Main Steam Safety Valves (MSSVs). The SG PORVs will fail closed on the loss of power and power must be restored to the SG PORV circuit to allow them to be opened from the Control Room. Natural circulation of the RCS will provide core cooling and the TDAFW pump will automatically provide flow from the AFWST to the D-Train SG to make up water lost due to the steam release.

During the first hour of the event, Operators will be dispatched locally to re-align AFW flow to all SGs. This will allow the SGs to cooldown symmetrically. Once the SG PORV control has been restored to the Control Room, then the SG PORVs are opened to reduce pressure to between 1130 and 1190 psig so the Main Steam safety valves will close. This reduced RCS temperature to approximately 571°F. A cooldown of the RCS is initiated within the first hour of the event to minimize inventory loss through the RCP seals per EC00 (Reference 11).

The TDAFW pump starts automatically on SG Low-Low level and does not require AC electrical power to provide AFW to the SGs. In the event that the TDAFW pump does not start on demand or trips after starting, an operator will restart the TDAFW pump per the EC00 procedure. The AFW system is normally aligned for the TDAFW pump to deliver flow to the D-Train SG, so the loss of all AC power EOP directs Operators to manually align flow to all four SGs. Manual control of TDAFW pump flowrate to the SGs for establishing and maintaining proper water levels in the SGs will be performed locally in the Isolation Valve Cubicle (IVC) per EC00 (Reference 11).

Steam release from the SGs will be controlled remotely from the Main Control Room using hydraulically-operated SG PORVs per EC00. Local manual operation of the SG PORVs can be performed in the event that hydraulic pressure is expended.

In accordance with the EC00 procedure, RCS cooldown and depressurization is initiated at a rate of less than 100°F/hr to a minimum SG pressure of 405 psig, which corresponds to an RCS core inlet temperature of approximately 450°F. The RCS cooldown minimizes the adverse effects of high temperature RCS coolant on RCP seal performance and reduces SG pressure to allow for SG injection from one of the FLEX SG makeup pumps in the event that the TDAFW pump becomes unavailable. The minimum SG pressure of 405 psig is sufficient to prevent nitrogen gas from the SI Accumulators from entering the RCS.

Analysis demonstrates that the plant can maintain this condition for 10 hours without the RCP seals experiencing two phase flow or reflux cooling occurring as defined in the NRC endorsement letter for the use of the PWROG NOTRUMP code for ELAP events (Reference 83). STP performs fuel cycle specific analysis to demonstrate that the reactor core remains subcritical for this period of time (Reference 84).

AFW supply is provided by the AFWST. Conservatively assuming the initial water level in the AFWST is at the low level alarm, the usable volume of this tank provides a sufficient source of AFW for a minimum of 32 hours of RCS decay heat removal (Reference 18).

The Phase 1 equipment including the TDAFW pump, SG PORVs, AFW regulating valves and the AFWST maintain the initial RCS cooling strategy. The Phase 2 FLEX equipment will be started as needed to support longer term cooldown. A FLEX RCS makeup pump for boron addition will be started to maintain adequate shutdown margin during the cooldown. A FLEX SG makeup pump will be aligned to support replacing the TDAFW pump when SG pressure will no longer support TDAFW pump operations.

3.2.1.2 Phase 2 Strategy

The Phase 2 FLEX strategy for reactor core cooling and heat removal continues to rely on feedwater from the AFWST using the TDAFW pump and, eventually, one of the FLEX SG makeup pumps powered by a FLEX DG.

Once the SI Accumulators have been isolated using FSG-10 (Reference 15), Operators initiate a second cooldown and depressurization of the RCS per the EC00 procedure (Reference 11), lowering the SG pressure to below the required 150 psig to run the TDAFW pump (Reference 16). One purpose of this subsequent cooldown and depressurization is to re-seat the Pressure Relief Valve (PRV) on the RCP seal return line that opened due to the increased RCP seal leakage early in the event. At about 12 hours into the event, the PRV should be re-seated (Reference 14). At approximately 23 hours following event start, pressurizer level will be restored and makeup to the RCS will no longer be required (Reference 14).

Prior to the completion of this second cooldown and depressurization, Operators start one of the two FLEX SG makeup pumps (Reference 11), line up the pump to feed all SGs, and secure the TDAFW pump (Reference 17). The FLEX SG makeup pumps take suction on the AFWST and are pre-staged inside the IVC in each unit in the C-Train and B-Train bays.

During Phase 2, core heat removal via the SGs will be maintained continuously. These FLEX SG makeup pumps are rated for a nominal pressure of 500 psig while flowing at 300 gpm, sufficient size for use in this strategy (Reference 14). FLEX connections are provided on the suction piping from the AFWST and on the AFW discharge cross-connect piping. Plant personnel will use FSGs to remove blinds and install short hoses and spool pieces in the system to facilitate supplying water with the FLEX pumps (References 22 and 17).

See Figure 3.2.1.2-1, below, for a photo of one of the SG makeup pumps.

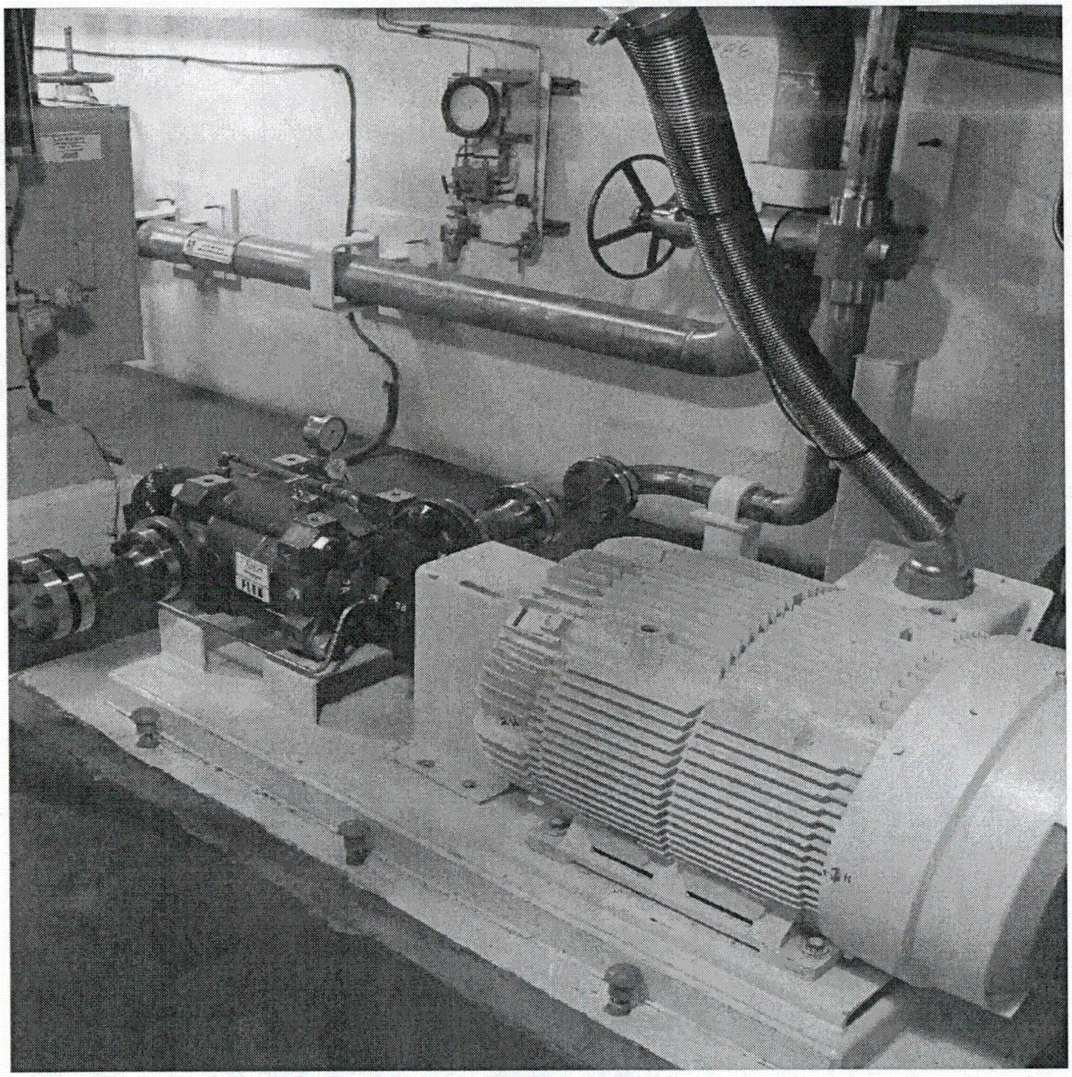

Figure 3.2.1.2-1 – Photo of SG Makeup Pump

During Phase 2, the SGs can also be filled using the portable Trailer-Mounted Diesel-Driven Pumps (TMDDPs) stored in the STP FLEX storage buildings. See Figure 3.2.1.2-2 for a diagram of the TMDDP method for SGs fill via one of the two Main Feedwater lines. Per FSG-03 (Reference 17), the TMDDPs can take suction from various water sources including outside water tanks, those containing demineralized water are the first priority, and from the Essential Cooling Pond (ECP) or Circulation Water underground piping if all water tanks have been depleted.

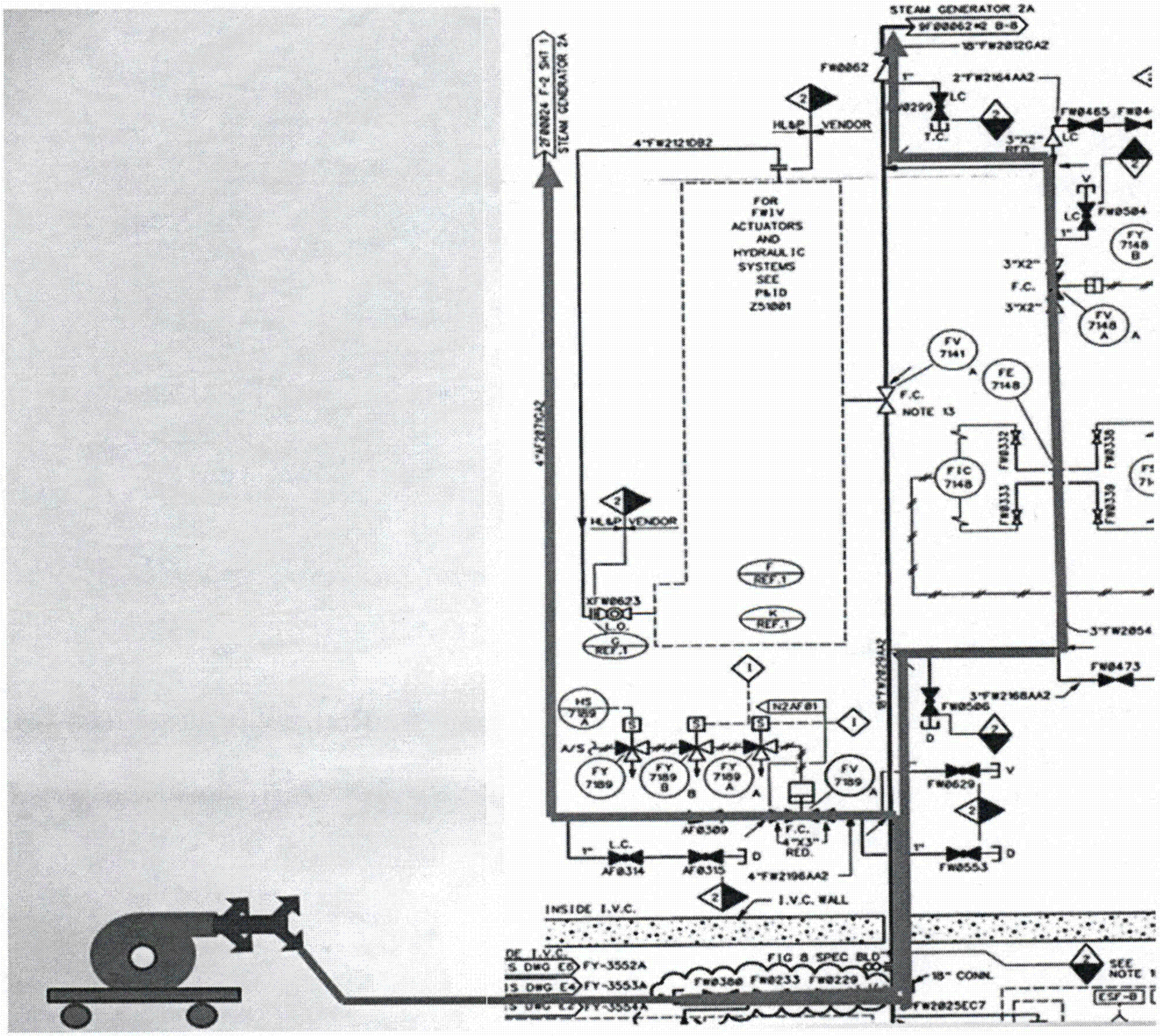

Figure 3.2.1.2-2 – Diagram of the TMDDP method for SGs Fill

Primary Strategy for Phase 2 RCS Fill

The primary strategy for filling the RCS utilizes a 35 gpm Chemical and Volume Control System (CVCS) Positive Displacement Pump (PDP) at 3100 psig that takes suction on either the Boric Acid Tanks (BATs) or the Refueling Water Storage Tank (RWST) and discharging into the CVCS charging line. A separate electrical power distribution system provides power from the FLEX DGs' distribution panel (DP1000) to the CVCS PDP. Locally at the PDP, a manual transfer switch is installed that permits powering the PDP from either its normal source, Motor Control Center (MCC) 1G8 (2G8), or from the FLEX DGs. See Figure 3.2.1.2-3, below.

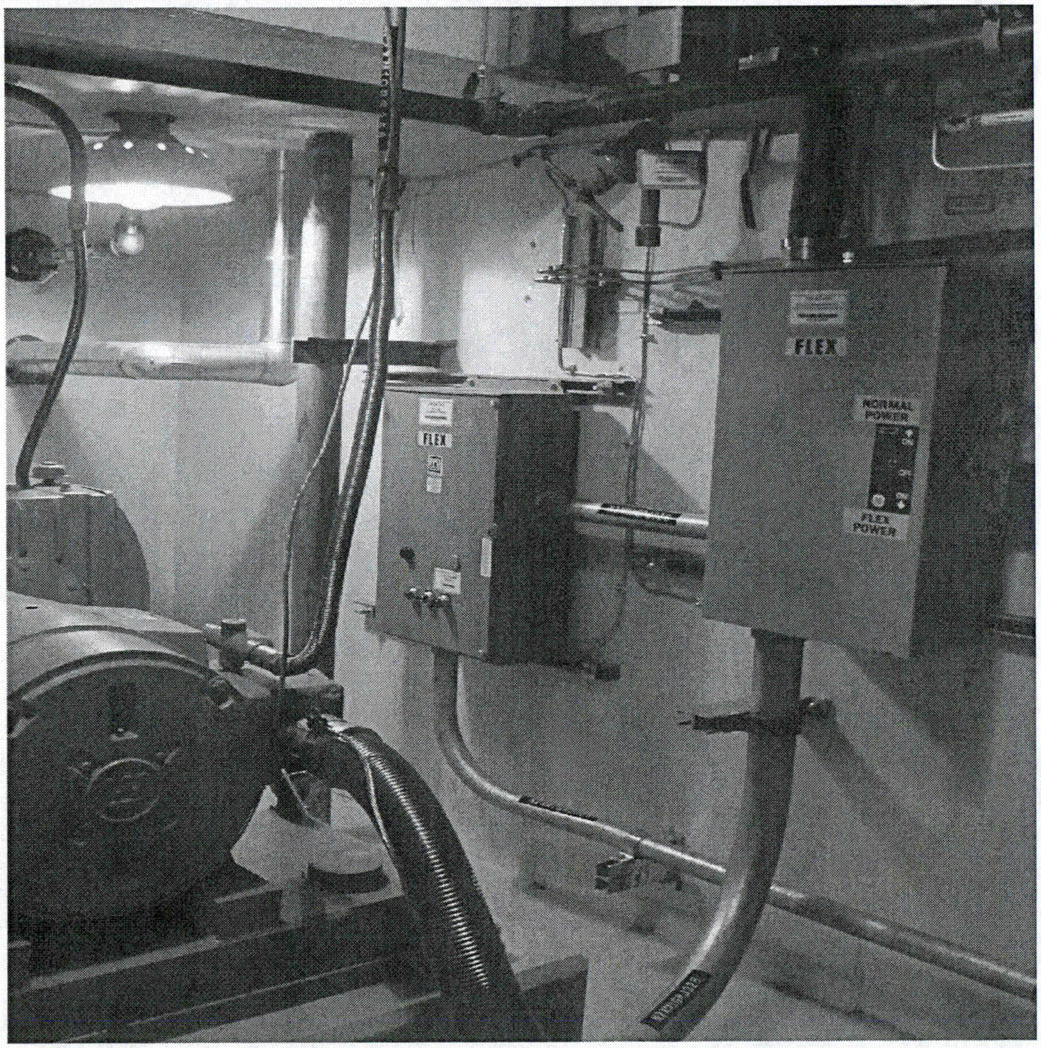

Figure 3.2.1.2-3 – CVCS PDP FLEX Power Transfer Switch

N+1 Strategy for Phase 2 RCS Fill

The N+1 strategy for filling the RCS utilizes a pre-staged 70 gpm FLEX RCS makeup pump at 700 psig installed in the Train 'A' SI pump bay in the Fuel Handling Building (FHB). This pump takes suction from the RWST and discharges into the SI line downstream of High Head Safety Injection (HHSI) discharge motor-operated valve (MOV) which is connected to the RCS. In the event that a bubble in the reactor head increases pressure above the FLEX RCS makeup pump's discharge head, STP has the ability to vent the reactor head using the Reactor Vessel Upper Head Vent valves as described in EC00 (Reference 11).

For the purposes of the FLEX timeline, STP conservatively assumes that operators will be able to start one of the FLEX DGs within eight hours following the ELAP event. The FLEX DG will power the FLEX RCS makeup pumps in order to provide boric acid to the RCS to maintain shutdown margin. See Figure 3.2.1.2-4, below, for a photo of the FLEX RCS makeup pumps.

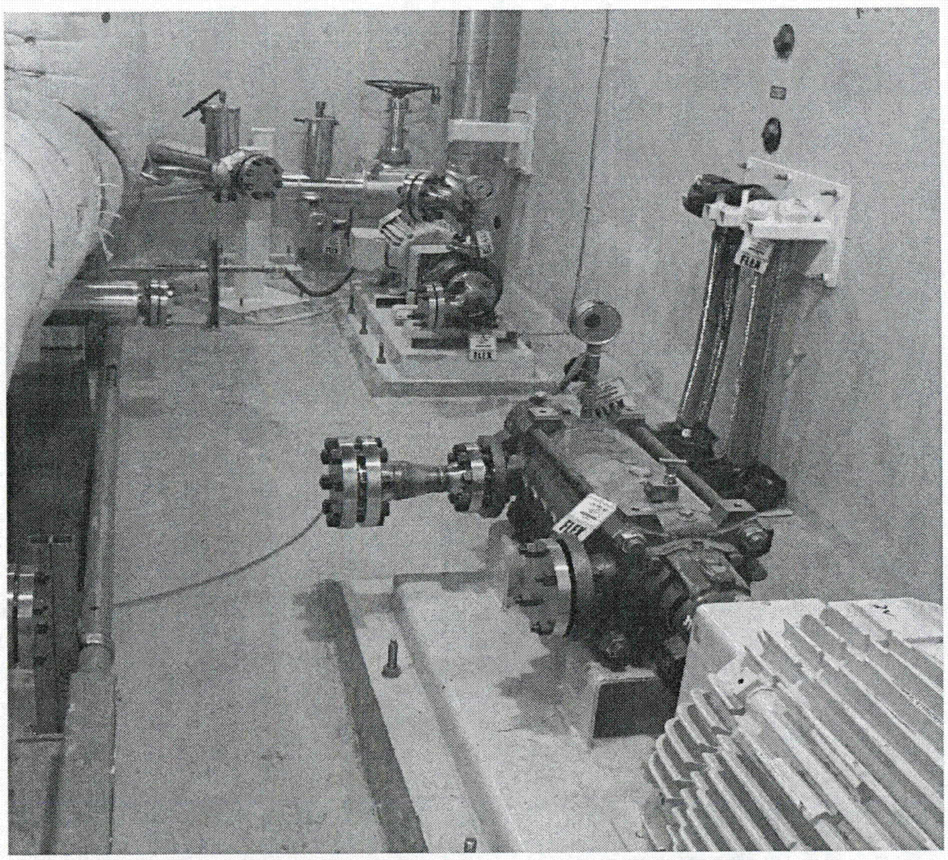

Figure 3.2.1.2-4 – RCS Makeup Pumps (Modes 1-4 and Modes 5 & 6)

STP has elected to use two installed RCS makeup pumps as the N and N+1 RCS fill strategies which is an alternate approach to the NEI 12-06 guidance. See Section 3.5 of this document, "Alternate Approaches", for additional details.

Considerations for Phase 2 RCS Fill Following a Flood Event

In the event of a large flood that prohibits movement around the site, the approximately 474,000 gallons of water are available in the AFWST and 148,000 gallons of water in the Condensate Deaerator (DA) can be used until flood waters recede (Reference 18). Flow from the DA to the AFWST is accomplished by gravity feed due to the elevation differences of the two tanks. Figure 3.2.1.2-5 below provides a diagram of the AFWST fill from the DA strategy.

The AFWST has sufficient capacity to provide AFW to the steam generators for approximately 32 hours after the initiation of the ELAP event. During this period, hoses are connected between the DA FLEX Feedwater Isolation Valve and the Auxiliary Feed Pump Recirculation Test Line Drain Valve which supplies the AFWST. Prior to opening the DA FLEX Feedwater Isolation Valve, the DA is vented for at least seven hours to reduce the pressure and temperature in the deaerator to atmospheric saturation conditions. As noted in FSG-06, if the DA is not allowed proper time for venting, this could result in a release of two-phase water into the transfer hoses. Steam suits and hearing protection staged in the Turbine Generator Building (TGB) can be used to support opening the valves to complete this venting action (Reference 27).

The additional water inventory from the DA extends the capacity of the AFWST to approximately 47 hours. In the event additional makeup to the AFWST could not be provided, the steam generators would contain sufficient inventory for approximately 58 hours before a loss of heat sink would occur.

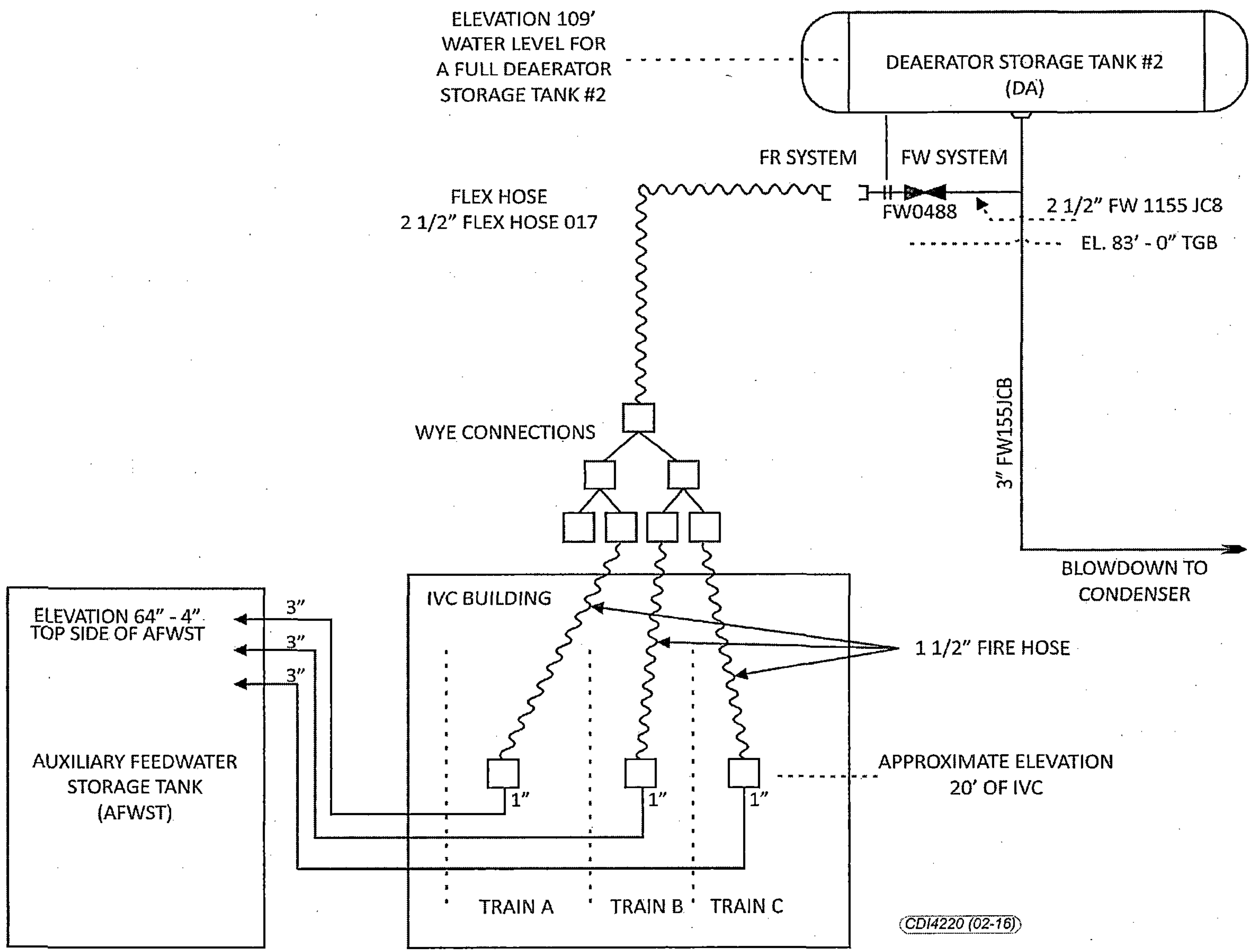

Figure 3.2.1.2-5 – AWFST Makeup from the DA

3.2.1.3 Phase 3 Strategy

The Phase 3 FLEX strategies for RCS cooling and heat removal continue to rely on the FLEX SG makeup pumps. During this phase, decay heat will eventually decrease to the point that steaming and feeding the SGs will only be periodically performed. This form of heat transfer can continue indefinitely.

As outlined in FSG-21 (Reference 19), the FLEX SG makeup pumps can be supplemented by one of the normal permanent plant AFW pumps powered from the Strategic Alliance for Emergency Response (SAFER) National Resource Center (NSRC) 4.16 KV turbine generators and AC distribution center that will arrive onsite approximately 24 hours following notification of the NSRC. The NSRC generator can provide power to a motor-driven AFW pump as well as other equipment on the same electrical bus.

The NSRC 4.16 KV generator provides additional defense-in-depth for temporary power options and is sized to power one of the three 4.16 KVAC ESF electrical switchgears. The cable tie-in locations for the NSRC generators are on the downstream side of the ESF transformers (Reference 19).

Note that the Phase 3 strategy does not rely on the delivery of the NSRC generator for core cooling – the site can continue to cope using the FLEX SG makeup pumps.

The NSRC will deliver other equipment that can be used for the Phase 3 core cooling strategy including the following:

- Low pressure, medium flow pump used to fill the SGs. Direction for use of this pump would come from the Emergency Response Organization (ERO).
- Diesel fuel transfer tank and associated pump used for fueling diesel driven equipment.

This equipment is listed in the STP SAFER Response Plan and associated site procedure (References 95 and 20).

3.2.2 Systems, Structures, Components

The following Structures, Systems, and Components (SSCs) are utilized in the FLEX strategies.

3.2.2.1 Pumps

Turbine-Driven Auxiliary Feedwater Pump

The TDAFW pump is a safety-related, missile protected and seismically qualified pump. The TDAFW pump located in the IVC which is designed for protection from applicable design basis external hazards.

The TDAFW pump should automatically start and deliver AFW flow to the D-Train SG following an ELAP/LUHS event. Two DC powered steam supply valves supply steam to the TDAFW pump turbine. These valves are normally closed and open to admit steam to the turbine on a SG Low-Low level or SI signal. The TDAFW pump turbine steam flow will either be controlled automatically by the governor valve or manually with the overspeed trip-throttle valve.

In the event the TDAFW pump fails to start, EC00 and FSG-07 (References 11 and 21) direct the operators to manually start the pump. A local vent fan for cooling the TDAFW pump room will be powered once the FLEX DG has been started and begins powering the designated MCCs (Reference 22).

Trailer-Mounted Diesel-Driven Pumps

There are two TMDDPs stored in the FLEX storage buildings located outside the protected area (PA) and a third unprotected pump stored inside the power block that is designated for use in response to mitigate 10 CFR 50.54(hh)(2) events. The specifications for these pumps are as follows:

- John Deere powered Gorman-Rupp pump
- 20 ft suction lift
- Approximately 1000 gpm at greater than 150 psig flowrate and pressure
- 130 gallon fuel tank
- 60 ft of 6 inch diameter suction hose including a floating strainer
- 3000 ft of 2.5 inch discharge hose

For the FLEX strategies, the primary function of the TMDDPs is to provide makeup water to the AFWST and the RWST in both units. The highest priority for use of the pump is filling the AFWSTs. The TMDDPs will not be required to makeup to either of these tanks for at least 24 hours. After 24 hours, the NSRC will begin providing additional pumps to perform the same functions.

The secondary function of the TMDDPs is to provide makeup water to the SGs and the SFP in the event that the N and N+1 FLEX makeup pumps are unavailable.

The TMDDPs and hose trailers are strategically separated to increase the likelihood that one of them survives a large external event. Additionally, the two TMDD pumps in the FLEX buildings have their wheels chocked to help ensure they are not damaged during a seismic event. The two pumps stored in the FLEX storage buildings are deployed to their needed locations by means of four wheel drive tractors stored with the pumps. The unprotected third pump and hose trailer is stored inside the PA.

FLEX SG Makeup Pumps

SG water injection capability is provided using two pre-staged FLEX SG makeup pumps (N and N+1) installed inside a Category 1 building in each unit. The FLEX SG makeup pumps are rated for a nominal pressure of 500 psig while flowing at 300 gpm. The FLEX SG makeup pumps are 480V motor-driven centrifugal pumps located in separate bays in the IVC. These pumps provide SG water injection in the event that the TDAFW pump can no longer perform its function (e.g. due to insufficient turbine inlet steam flow from the SG). Hydraulic analyses have confirmed that the FLEX SG makeup pumps are sized to provide the minimum required SG injection flowrate to support reactor core cooling and decay heat removal (References 23 and 24).

FLEX RCS Makeup Pumps

The N and N+1 FLEX RCS makeup pumps are installed in different locations inside Category 1 buildings and have different suction and discharge piping arrangements. The N pump is the CVCS PDP which provides approximately 35 gpm at 3100 psig. The N+1 pump is a centrifugal pump that provides 70 gpm at 700 psig. The N+1 pump is a lower pressure pump because the reactor head can be vented to reduce pressure (Reference 11), ensuring this pump is sufficiently sized to fill the RCS. Hydraulic analysis of the RCS makeup pumps with the associated hoses and installed piping systems confirm minimum flow rate and head capabilities exceed the FLEX strategy requirements for maintaining RCS inventory (References 25 and 26).

3.2.2.2 Water Sources

Table 3.2.2.2-1 lists the qualified water sources (demineralized or borated) used in the STP FLEX strategies. All listed water sources are protected against environmental hazards including seismic, external flooding, high winds, low temperature, high temperature.

Water Sources	Required Minimum Volume (gal)	Normal Volume (gal)	Water Quality
RWST	458,000 (TS limit)	518,000	Borated
AFWST	485,000 (TS limit)	508,000	Demineralized
BATs	27,000 (TRM limit)	60,000	Borated
RMWST	N/A	122,000	Demineralized
ECP (shared)	N/A	112 million	Well water

Table 3.2.2.2-1 – Qualified Water Sources for FLEX

Note that the useable volume of the RWST is 398,000 gal, as defined in Section 6.3.2.2 of the UFSAR (Reference 44). The useable volume of the AFWST is 474,000 gal, as defined in STP's calculation for the time to loss of heat sink during an ELAP (Reference 18).

The FSGs also list alternate water sources for use in the FLEX strategies (References 17, 27 and 41), including:

- Secondary Makeup Tank (SMUT), clean water, high usage priority
- Demineralized Water Storage Tank (DWST), clean water, high usage priority
- Deaerator Storage Tank, SG feedwater, high usage priority
- Fire Water Storage Tank, ground water, medium usage priority
- Service Water Storage Tank, ground water, medium usage priority
- Organics Basin, medium usage priority
- Essential Cooling Water (ECW) Pond, brackish water, low usage priority
- Circulating Water underground piping, brackish water, low usage priority

Additional details on the qualified water sources are provided below.

<u>Auxiliary Feedwater Storage Tank</u>

The AFWST is a safety-related, seismic and tornado-missile protected structure designed to withstand the applicable design basis external hazards stated in NEI 12-06. The AFWST is normally aligned to provide emergency makeup water to the SGs and it is the preferred AFW system water source at the onset of the ELAP event. Per Technical Specification (TS) 3.7.1.3, the minimum volume of each Unit's AFWST is maintained at 485,000 gallons. As outlined in FSG-06, following the onset of an ELAP/LUHS event the AFWST will be supplied with water from a variety of sources, including the ECP in a worst-case-scenario using the TMDDPs (Reference 27). See Figure 3.2.2.2-1, below, for a photo of a typical tank drain that will be used as a source of water, if available.

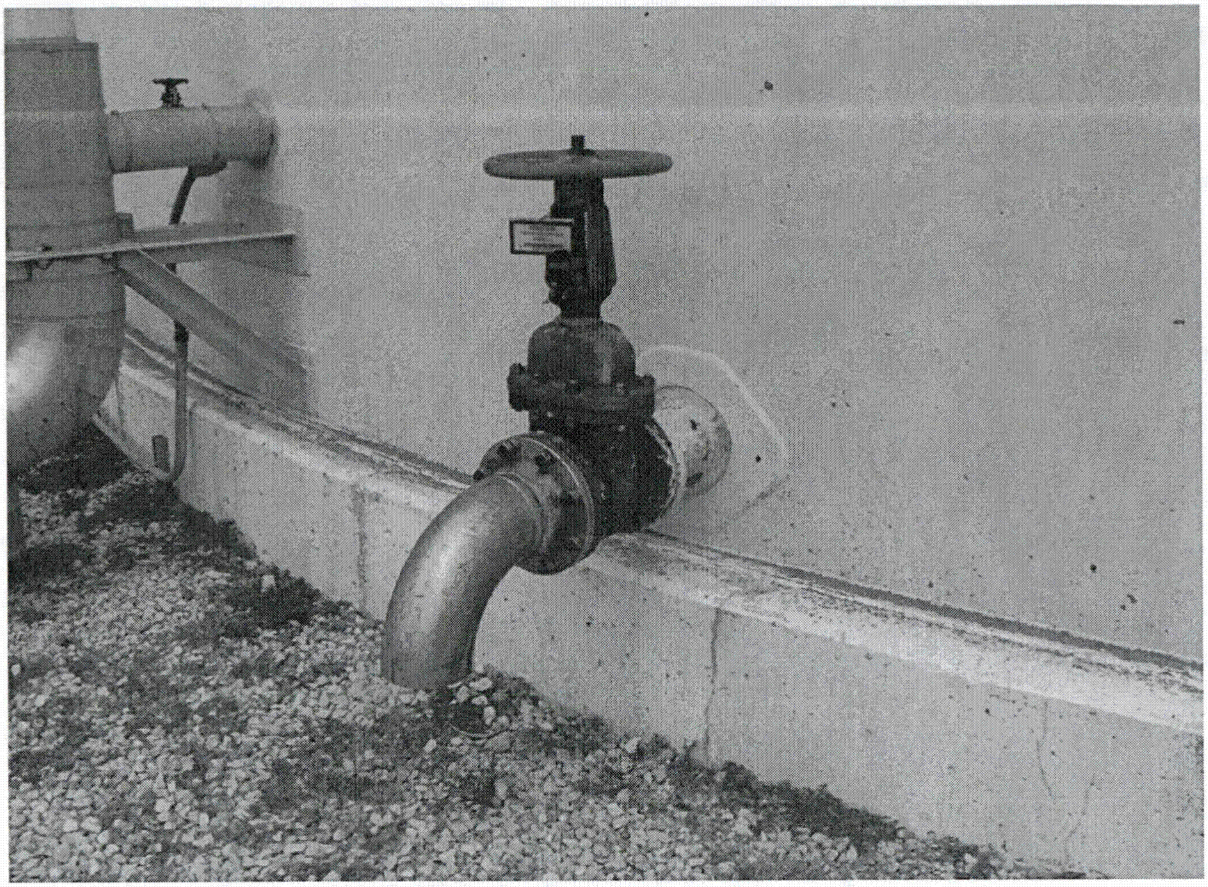

Figure 3.2.2.2-1 – Typical tank drain at STP

Assuming RCS cooldown rate of less than 100°F per hour, the maximum cooldown rate allowed by the EC00 procedure, each Unit's AFWST would provide sufficient water for 32 hours of coping time (Reference 18).

An emergency fill valve has been installed on top of each AFWST along with 100 ft of 2.5 inch diameter fire hose that will be used to fill the AWFST with firewater, if necessary. Figure 3.2.2.2-2 shows the connection point.

In the event that this valve or associated piping is damaged, the 2 inch nitrogen lines with threaded connections can be connected to the fire water connection and used to fill the AFWST. The nitrogen lines are shown in Figure 3.2.2.2-3 below.

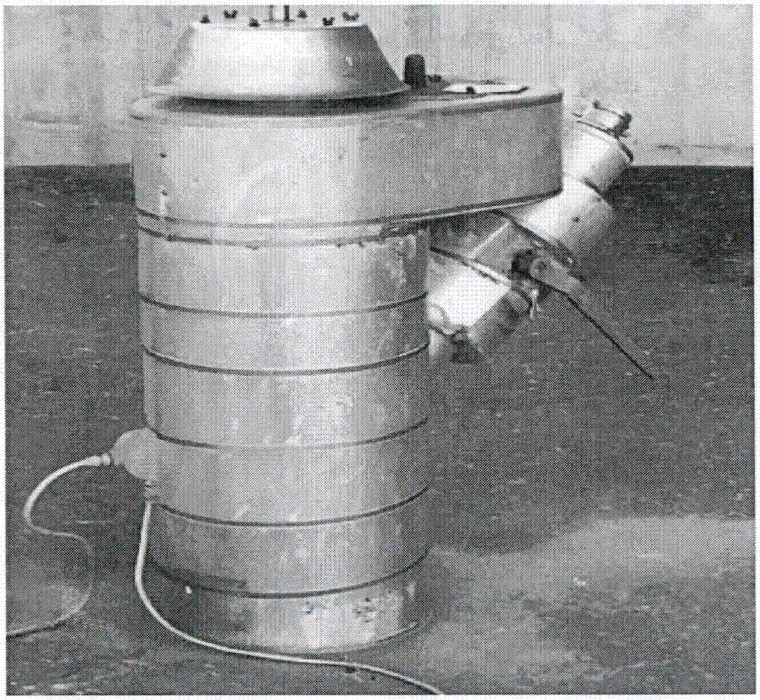

Figure 3.2.2.2-2 – AFWST Emergency Fill Method fire water connection

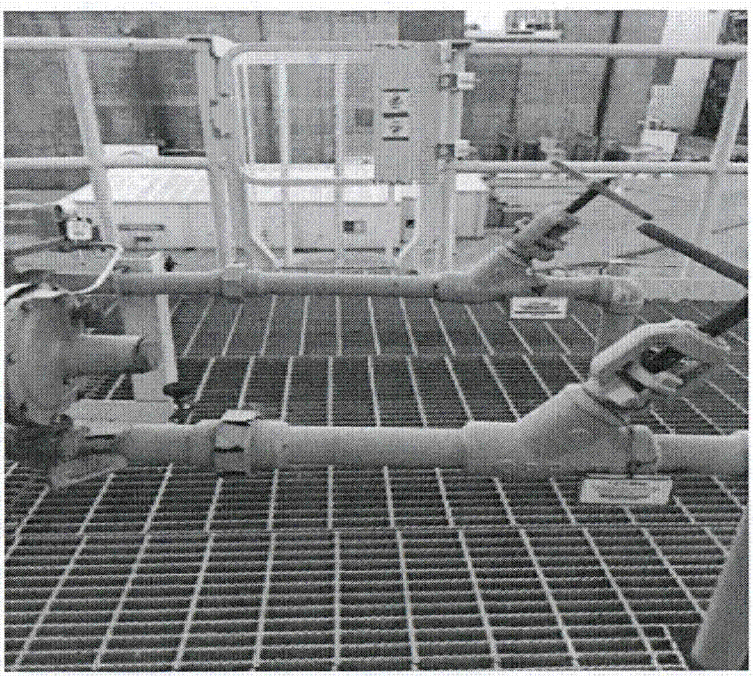

Figure 3.2.2.2-3 - AFWST Emergency Fill Method through nitrogen lines

In the event of an MCR breach, the site will be flooded with water and the TMDDPs will not be able to be brought to their pumping locations before the AFWST would need to begin being refilled. In this flood-hazard specific scenario, water from the DA will be used to begin refilling the AFWST. As described in FSG-06, the DA must first be vented for at least seven hours prior to opening the FLEX FW isolation valve for the AFWST fill line (FW-0488) to begin refilling the AFWST (Reference 27). This action is performed to ensure that there is not a release of two phase fluid (water and steam) into the transfer hoses.

Refueling Water Storage Tank

The RWST is a borated water source for the FLEX RCS makeup strategies. Each unit has one RWST located inside the MAB. The tanks are stainless steel, safety-related and seismically qualified storage tanks that are completely protected from the applicable design basis external hazards. During at-power operations, each operating unit's RWST borated volume is maintained greater than 458,000 gallons as required by TS 3.5.5 at a boron concentration between 2800 and 3000 ppm.

Before the RWST is depleted, it will be refilled using a TMDD pump taking suction on an unborated tank, basin or the ECP as listed in FSG-17 (Reference 28).

Boric Acid Tanks

The BATs are an additional source of borated water that provide a suction source to the CVCS PDP. The BATs are protected from external events inside the MAB. Per the STP procedure for the mixing of boric acid, 0POP02-CV-0003, the BATs are typically maintained with a combined total of approximately 60,000 gallons of water with a minimum boron concentration of 7000 ppm (Reference 29). STP Technical Requirements Manual (TRM) Section 3.2.1.6 requires a minimum volume of 27,000 gallons for the Boric Acid Storage System.

Essential Cooling Water Pond

The ECP is a man-made excavated below grade pond with an approximately 8 ft high embankment completely surrounding its perimeter. It is normally filled via the well water system. As stated in UFSAR Section 9.2.5.2, the ECP has a surface area of 39.2 acres at an elevation of 17 ft and 46.5 acres at elevation 25.5 ft. As stated in UFSAR Section 9.2.5.1.1.2, the ECP has approximately 112 million gallons of storage capacity. If no other water sources are available, one of the TMDD pumps can be positioned to take suction on this pond and deliver water to both Units' AFWST and RWST.

3.2.2.3 Other Components

Steam Generator Power Operated Relief Valves

The SG PORVs are safety-related and seismically qualified valves. Power to the SG PORV controllers in the Main Control Room is normally provided by Class 1E 120 VAC power and 480 VAC is supplying the hydraulic pump to maintain hydraulic pressure for normal operation.

During the ELAP event, a relay loses power in the SG PORV circuitry causing the valves to fail closed. EC00 directs Operators to manipulate SBO switches to re-energize this relay, returning control of the SG PORVs to the Main Control Room (Reference 11). This procedural action aids in minimizing field activities and maximizing SG PORV control response.

Operation of the SG PORVs from the Main Control Room will continue until hydraulic pressure is depleted, at which time manual control will be initiated via local manual controls. The SG PORVs can be cycled at least 1.5 full strokes without the hydraulic pump in operation. A manual hydraulic hand pump located in the TGB can be utilized to locally provide hydraulic pressure for additional strokes.

Class 1E Batteries

The safety-related Class 1E batteries and associated DC distribution systems are located within safety-related structures designed to meet applicable design basis external hazards. During an ELAP event, these batteries are initially relied upon to power required key instrumentation and applicable DC components.

Per FSG-04 (Reference 30), Operators begin stripping all non-essential loads within one hour following a BDBEE to extend the Class 1E battery life. Load stripping actions will be completed within the next hour. These actions extend the useable Station Class 1E battery life to at least eight hours for each unit (Reference 31).

The FLEX DGs will be used to repower instrumentation prior to battery depletion per FSG-19, FSG-05, and FSG-04 (References 32, 22 and 30).

3.2.3 FLEX Strategy Connections

Primary SG Makeup Pump Connection

The primary connections to supply makeup water to the SGs are located on the AFW system suction and cross-connect lines in the IVC. Following the ELAP event, flexible hoses or spool pieces will be routed from the FLEX SG makeup pump suction and discharge to the primary connections in the AFW system per FSG-03 (Reference 17). Hydraulic analyses of the flowpaths confirmed that applicable performance requirements are met (References 23 and 24). IVC Train B and C bays each contain a FLEX SG makeup pump. Each train is separated by individual watertight doors. One of the two FLEX SG makeup pumps is the N FLEX SG makeup pump. The pump used for the primary N pump has its own independent connection points associated with that train.

Alternate SG Makeup Connection

In the event that the N SG makeup pump is not available for makeup to the SGs, the N+1 FLEX SG makeup pump will be used. The N+1 pump is located in the other Train bay of the IVC and utilizes alternate suction and discharge connection points.

Primary RCS Connection

The primary connection for RCS makeup is via the CVCS system using the permanent plant PDP installed in the MAB. Normal CVCS piping is used for the suction and discharge flowpaths. The BATs are the primary suction source for the CVCS PDP and the RWST is available as a secondary suction source.

Alternate RCS Makeup Connection

The alternate connection for RCS makeup is via the RCS makeup FLEX pump installed in the FHB. The suction connection is located on the SI suction header for the A-Train SI pump and the discharge connection is downstream of the A-Train HHSI pump discharge MOV to the RCS hot leg. As directed by FSG-08, flexible hoses are used to attach the FLEX pump to the SI suction and discharge piping (Reference 33).

480 VAC Electrical Power Connections

The two 1-MW FLEX DGs provide power to both the RCS makeup and the SG makeup pumps by means of permanent power distribution circuits. The FLEX DGs are located on the MAB roof in a missile protected enclosure. Separate electric power distribution feeds from the independent FLEX DGs can provide power to the FLEX Distribution Panel. An interlock is provided to only allow one FLEX DG to be aligned to the FLEX Distribution Panel. The FLEX Distribution panel provides a direct electrical AC power source to the FLEX components independent from the site's normal electrical distribution system. FLEX electrical power circuits have been permanently installed inside Category 1 buildings to ensure a quick and dependable response to the ELAP event.

4160 VAC Electrical Power Connections

Two 1-MW 4160 VAC generators delivered to each STP Unit from the NSRC can be connected to ESF transformers on the downstream (load) side. The deployment location for the NSRC generators is the area near the ESF transformers. The NSRC will supply 300 feet of generator cable, affording the flexibility to park the generators in a variety of locations. Operators may elect to maintain power to loads supplied by the 480V FLEX DG when the NSRC generator arrives or to de-energize one train (A, B or C) of the AC busses that the FLEX 480V DG was supplying and place this power source in service. The Emergency Director or Shift Manager will determine which of the three ESF transformers, if any, will be connected to the NSRC generators, depending on the needs of the plant and the condition of the individual transformers. This is proceduralized in the FSG-21, "NSRC Turbine Generator" (Reference 19).

3.2.4 Key Reactor Parameters

Instrumentation providing the following key parameters is credited for all phases of the reactor core cooling and decay heat removal strategy with indication available in the Main Control Room:

- Auxiliary Feedwater Flowrate - AFW flowrate indication will be available.
- SG Water Level - SG wide range (WR) water level indication will be available.
- SG Pressure - SG pressure indication will be available in the Main Control Room and locally in the IVC for all SGs.
- RCS Temperature - RCS WR hot-leg and cold-leg temperature indication will be available.
- RCS Pressure – RCS WR pressure indication will be available.
- Core-Exit Thermocouple Temperature – Core-exit thermocouple temperature indication will be available.
- AFWST Level – AFWST water level indication will be available in the Main Control Room and locally using indication installed on the tank.
- Pressurizer Level – Pressurizer level indication will be available.
- Reactor Vessel Water Level (RVWL) - RCS level indication from the RVWL will be available.
- Ex-Core Nuclear Instruments – Indication of nuclear instrumentation activity will be available.

FLEX equipment is also supplied with local instrumentation necessary for operating the equipment. FSG-07 and FSG-20 provide guidance for obtaining the above critical parameters locally when instrument power is unavailable (References 21 and 34).

3.2.5 Thermal Hydraulic Analyses

3.2.5.1 RCS Response

STP used the RETRAN-3D Input Model to determine RCS response as documented in STP calculation STP-CP-006 (Reference 14). The following conclusions were drawn from the RETRAN ELAP analysis:

- The RCS can be cooled down and maintained at the target steam generator pressure.
- The boron provided by the SI accumulators to the RCS combined with the boron supplied by the RCS makeup pumps from the RWST or BATs is sufficient to allow the Operators to cool-down the RCS to 300°F and depressurize the RCS to less than 135 psig within 24 hours.
- Flow from the primary FLEX RCS makeup pump is sufficient to borate the RCS to Xenon-free conditions.
- The SG PORVs are adequately sized to maintain the RCS temperature at or below 300°F and RCS pressure less than 135 psig.
- The alternate N+1 FLEX SG makeup pump may be required to provide inventory to the SG during Phase 2 due to low steam pressure to the TDAFW pump.
- Adequate boron mixing occurs under single and two-phase flow conditions to prevent a return to criticality.

3.2.5.2 Reactor Coolant Pump Seals

The leakage model for the RCP No. 1 seal used in the FLEX strategy analyses is based on results presented in Westinghouse Report PWROG-14015-P, Revision 2 (Reference 35). STP is a Category 6 plant as defined in the Westinghouse Report, however the STP FLEX analysis conservatively assumed the higher leak rate presented in the Westinghouse report for a Category 1 or 6 plant. This leak rate was used in a site-specific model to determine that the time to RCP seal uncovery occurs at 11.3 hours and reflux cooling occurs at 15.9 hours following the initiation of the ELAP event.

The expected timeline to restore flow to the RCS is within four hours when using the PDP or within eight hours using the FLEX makeup pump if the PDP is not available.

While PWROG-14015-P has not yet been approved by the NRC, the following additional conservatisms provide reasonable assurance that RCP seal uncovery or reflux cooling will not occur:

- The results of the analysis documented in the RETRAN-3D White Paper (Reference 36) show that the RETRAN-3D STP computer model conservatively predicts the time to RCP seal uncovery (13.1 hours for RETRAN-3D vs. 13.5 hours for RELAP5) and time to reflux cooling (17.9 hours for RETRAN-3D and 24.9 hours for RELAP5) when compared to a similar RELAP5 STP computer model.
- The Pressurized Water Reactor Owner's Group (PWROG) ITCHSEAL calculations used to determine RCP seal leakage contain known conservatisms when compared to the results of the generic analysis to the Montereau test data. As discussed in Westinghouse Report PWROG-14074-P, parameters within the ITCHSEAL calculations used for the STP RCP seal leakage values were adjusted to ensure significant margin when compared the Montereau test data (Reference 37).
- FSG-01 and FSG-08 are used to monitor RCS inventory (e.g. reactor pressure vessel water level) during the ELAP event and direct the operators to implement primary makeup more rapidly if signs of increased RCP leakage are detected (References 38 and 33).

3.2.6 Shutdown Margin Analysis

Per the site Core Reload Design Process, STP performs an evaluation for each fuel cycle to ensure that the reactor maintains a k_{eff} of 0.99 or less (Reference 84). In addition, Operators are provided curves of the required boron concentration versus fuel cycle burnup for several RCS temperature conditions for equilibrium xenon and xenon free conditions to use as a guide to ensure the reactor core k_{eff} remains at or below 0.99 (References 85 and 86) as recommended in Westinghouse Report WCAP-17601 (Reference 96).

3.2.7 Electrical Analysis

The eight hour Class 1E battery duty cycle for STP was calculated in accordance with the IEEE-485 methodology using manufacturer discharge test data applicable to the FLEX strategy as outlined in the NEI white paper on extended battery duty cycles (References 40 and 97). There are approximately two hours between the calculated battery duration for use in the FLEX strategy and the expected deployment and startup time for FLEX equipment to supply the DC loads.

Within eight hours of the start of the event, the 480V FLEX DGs will begin re-powering one battery charger in each of A and C trains.

3.3 Spent Fuel Pool Cooling and Inventory

The STP FLEX strategy for maintaining SFP cooling is to monitor SFP level using remote and local indicators and to provide sufficient makeup water to the SFP to maintain the normal SFP level. Note that STP has individual SFPs for Unit 1 and Unit 2 located in their respective FHBs.

Initial actions to monitor level and, as necessary, stage makeup and spray hoses on the fuel pool deck need to be completed early in the event. FSG-11 directs plant personnel to evaluate the need to provide a ventilation pathway for water vapor to leave the FHB (Reference 41). The most time sensitive scenario occurs with a full core offloaded into the SFP.

3.3.1 Phase 1 Strategy

During Phase 1, the loss of AC power makes the SFP Cooling and Cleanup System unable to circulate water through heat exchangers. This causes the SFP to gradually heat up from the decay heat being transferred into the water from the spent fuel and the water begins to evaporate. To calculate the required makeup water volume and rate required to maintain normal SFP level, STP assumed the worst-case maximum design heat load for the SFP with every SFP cell containing a spent fuel assembly.

The Phase 1 activities consist of establishing FHB vent pathways and monitoring for water accumulation. The normal fill methods would not be available with a loss of AC power. Since FLEX equipment is required for SFP inventory, a fill strategy is established in Phase 2.

3.3.2 Phase 2 Strategy

STP has a primary and alternate SFP fill strategy that is implementing using FSG-11. The primary method for filling the SFP is to start a Reactor Makeup Water (RMW) pump and open manual valve FC-0048, the SFP RMW Supply Valve (Reference 41). The RMW pump component design parameters are listed in UFSAR Table 9.2.7-1 (Reference 44). Both RMW pumps receive power from the FLEX DGs via MCC E1B4(E2B4) or MCC E1C2(E2C2). Closing the feeder breaker to the selected RMW pump will provide control power to start the pump from the Control Room. Once FC-0048 is open and the RMW pump is started, SFP re-fill can commence at approximately 300 gpm (Reference 43). SFP level will still be well above the point at which radiation levels on the operating deck make the SFP deck uninhabitable. The water level in the pool will be monitored from the Rad Waste Control Room in the MAB.

NEI 12-06 requires a makeup method for the SFP that does not require accessing the operating deck. FC-0048 can be accessed without crossing the operating deck utilizing a travel route through the FHB truck bay. From the truck bay, valve FC-0048 can be accessed by going up the stairwell to the 53' elevation and then down another stairwell to the 21' elevation leading to the SFP Cooling and Cleanup pump 1B(2B) Room.

Water from the RMWST is non-borated demineralized water, however, it can be used to fill the SFP because of the design basis and construction of the Spent Fuel Storage Rack system. As stated in STP UFSAR Section 4.3, the design basis for preventing criticality in the spent fuel pool is as follows (Reference 44):

- The effective neutron multiplication factor, k_{eff}, of the fuel rack array will be less than 1.00 in pure, unborated water, with a 95 percent probability at a 95 percent confidence level, including uncertainties; and,
- The effective neutron multiplication factor, k_{eff}, of the fuel rack array will be less than 0.95 in the pool containing borated water, with a 95 percent probability at a 95 percent confidence level, including uncertainties.

In the event the primary SFP fill strategy is not available, the "hose to the pool" method will be implemented. This alternate strategy uses a 250 gpm, 150 psi pre-staged FLEX SFP makeup pump installed in the FHB in the B-Train SI bay. The FLEX SFP makeup pump flow also meets the NEI 12-06 requirement for exceeding the boil-off rate.

This pump discharges into a pipe that runs from the -29' elevation of the FHB up to the operating deck at the 68' elevation. Fittings are installed on the end of the pipe on the operating deck and temporary hoses have been staged in the area. Plant personnel will install a short hose/spool piece between the Containment Spray suction piping and the pump suction (Reference 41). The FLEX SFP makeup pump takes suction from the RWST and relies on the FLEX DGs for power. A permanent power cable has been run though conduit from the distribution panel on the MAB roof to the bottom of the FHB to power the pre-staged FLEX SFP makeup pump.

If it becomes necessary to spray the SFP from the pre-staged SFP spray monitors, the "spray method" uses the FLEX SFP makeup pump and hoses routed from the same hard pipe on the operating deck to a spray monitor on the south end of the SFP deck. A flow of 250 gpm is required per NEI 12-06 (Revision 0) with 50 gpm included for margin for overspray (Reference 9).

3.3.3 Phase 3 Strategy

SFP cooling can be maintained indefinitely using the Phase 2 makeup strategy. In Phase 3, the NSRCs will provide equipment that can be used to ensure water is always provided to cool the spent fuel for operational flexibility and additional defense-in-depth. For example, the NSRC 4.16 KV generators can provide power to a LHSI pump used to makeup to the SFP in emergency situations.

Prior to the depletion of the RWST, either the ECP or an unprotected tank that survived the event will be used as the water source to makeup to the RWST or the SFP. The NSRC also provides additional TMDDPs that could be used to replenish the RWST and to makeup to the SFP.

3.3.4 SFP Makeup Connections

3.3.4.1 Primary Connection

The primary, N, pump for SFP makeup is the RMW pump located on the 10' elevation of the MAB of each Unit. The suction source for this strategy is the RMWST. The RMW is one of the normal fill methods for the SFP. The RMW piping connects to the SFP piping through manual fill valve FC-0048. This strategy utilizes a different piping arrangement and connections for both the suction source and the discharge to the SFP than the alternate N+1 pump.

3.3.4.2 Alternate Connection

The alternate, N+1, pump is the FLEX SFP makeup pump is located in the -29 ft elevation of the FHB of each unit in the B Train SI bays. The suction source for this strategy is the RWST. The borated water from the RWST goes through the SI piping to the B Train Containment Spray suction where a hose/spool piece has been installed to route the water to the FLEX SFP makeup pump. The discharge of the FLEX SFP makeup pump goes through FLEX piping to the SFP deck on the 68' elevation. Then from the FLEX piping the water goes directly into the SFP through fire hoses or it is routed to a spray monitor. This discharge piping arrangement and the suction source is different from the N SFP makeup pump, as is the suction source.

3.3.5 Fuel Handling Building Ventilation

Ventilation requirements to prevent excessive steam accumulation in the FHB are described in FSG-11 which directs operators to open doors in the FHB and MAB to establish a natural circulation flowpath (Reference 41). Airflow through these doors provides ventilation pathways through which steam generated by SFP boiling can exit the FHB.

3.3.6 Key Parameters

The key monitoring parameter for the SFP makeup strategy is SFP water level which is monitored by instrumentation installed in response to Order EA-12-051 for Reliable SFP Level Instrumentation (Reference 45). STP's SFP level instrumentation consists of two separate channels of microwave pulses that are transmitted by the sensor electronics system through a waveguide pipe to a horn that is just above the water line. The waveguide pipe transports the level measurement signal to the electronic display in the Rad Waste Control Room.

3.3.7 Thermal-Hydraulic Analyses

Loss of SFP cooling is assumed to occur at 30 days after core reload is complete. At this time, the SFP decay heat is the highest during power operations. Higher decay heat gives higher boil-off rate and a lower time to reach 200°F.

The SFP heat-up rate as a function of time following a loss of SFP cooling is provided in Plant Curve Book Figure 5.13A for each Unit. The time to reach 200°F as a function of time following a loss of SFP cooling is provided in Plant Curve Book Figure 5.19A for each Unit.

The SFP temperature is normally maintained at less than 100°F. Assuming a conservatively high initial SFP temperature of 100°F, the time to reach 200°F is approximately 29 hours. The boil-off rate at this time is approximately 28 gpm, well within the makeup capability of the RMW pump (300 gpm) and SFP makeup pump (250 gpm). Assuming the SFP level is at the Technical Specification required minimum elevation of 62.5 ft, the time for the SFP water level to boil down from the minimum level to 10 feet above the top of the active fuel is 83 hours (Reference 46). Maintaining the water level greater than 10 feet above the active core should limit the maximum radiation dose to 2.5 millirem per hour for personnel in the area (Reference 102).

3.3.8 Pumps and Water Supplies for SFP Fill

3.3.8.1 Reactor Makeup Water Pump

There are two RMW pumps per unit rated at 300 gpm flowrate at a pressure of 150 psig (Reference 106). For the FLEX strategies, the sole function of the RMW pumps is to add water to the SFPs. Water can be added to the SFP once the FLEX DGs begin providing power to the pumps and manual valve FC-0048 is opened (Reference 41).

3.3.8.2 FLEX SFP Makeup Pump

The FLEX SFP makeup pump can provide 250 gpm of water at 150 psig (Reference 104 and 105) for either SFP fill or spray functions. This pump is located inside the FHB -29 ft elevation B-Train SI bay and takes suction from the RWST.

3.3.8.3 Trailer-Mounted Diesel-Driven Pumps

The TMDDPs can be used for filling or spraying the SFP (References 43 and 87). The suction source for these pumps is either the Organic basin at the south end of the plant, the Circulating Water discharge piping, or the Fire Water header if it remained intact following the BDBEE. The hoses for the TMDDPs will be routed into the FHB truck bay on ground level and be connected to hoses staged on a platform below the SFP operating deck. The staged hoses are connected to the spray monitors located on the SFP operating deck.

3.4 Containment Integrity

3.4.1 Phase 1

For scenarios that utilize SGs to remove core heat from containment, no specific coping strategy is required for maintaining containment integrity during Phase 1, 2 or 3. In this case, the only necessary action is to monitor containment pressure and temperature to verify that RCS leakage is minimal per standard procedures.

Containment conditions are monitored via the available Qualified Display Parameter System (QDPS) indications or used by FSG-20.

When an ELAP occurs while a Unit is operating in Modes 1-4, containment is isolated via normally closed or fail closed isolation valves, check valves, or valves that will be manually closed by personnel as directed in the EOPs. As stated in NEI 12-06, no valve failures are assumed to occur following the BDBEE (Reference 9).

STP performed analyses using the RETRAN-3D and GOTHIC computer models (References 14 and 47) to confirm that the containment pressure during and following an ELAP event would not challenge the design basis pressure of 56 psig and the containment temperature would not exceed the equipment qualification limits. The RETRAN-3D analysis determined the RCP seal leakage rates and RCS piping temperature while a GOTHIC analysis determined the containment pressure and temperature response using the RETRAN-3D results. The results of the analysis show that the maximum containment pressure increase is less than 2 psig and the maximum containment temperature is 144°F for Phases 1, 2, and 3, well below the limits for both containment pressure and equipment qualification temperature (Reference 47).

3.4.2 Phase 2

During Phase 2, an unexpected pressure rise can be addressed by venting or cooling containment. FSG-12 provides several different methods for providing containment cooling. With the support of the TSC, the containment cooling strategy will be determined based on equipment availability (Reference 48).

3.4.3 Phase 3

During Phase 3, any necessary actions to reduce containment temperature and pressure utilize existing plant systems powered by offsite equipment. Two portable 4160 VAC generators and a distribution panel for each unit will be brought in from the NSRC and can be used to supply power to one of the three Class 1E 4160 VAC buses in each unit, providing another option for powering various station pumps or fans.

As described in FSG-12, in the event it becomes necessary to cool or depressurize containment, the 4160 VAC NRSC DGs could also be used to power the Reactor Containment Fan Coolers (RCFCs) to accomplish this task. FSG-12 also describes an option for spraying the outside shell of containment using the TMDDPs to reduce temperature and pressure.

3.4.4 Equipment for Ventilation Cooling and Spray Strategies

The following equipment can be used for cooling and venting Containment if deemed necessary:

- Containment Spray pump powered by the NSRC generators
- Containment Purge fans powered by the NSRC generators
- RCFCs powered by the NSRC generators
- Component Cooling Water (CCW) pump powered from the NSRC generators
- TMDDPs stored on site or delivered from the NSRC

The NSRC will provide a low pressure, high flow pump (nominal 5000 gpm) which can be used to provide cooling loads to various water systems. A low pressure, medium flow (nominal 2500 gpm) pump will also be provided by the NSRC, if needed. As discussed previously, water supplies are listed in the FSGs by order of preference. When the RWST is depleted, other tanks and basins will be drawn from if available and the ECP can be used as a last resort.

3.4.5 Key Containment Parameters

Instrumentation providing the following key parameters is available and is credited for the Containment Integrity strategy for Phases 1 through 3:

- Containment Pressure indication
- Containment Temperature indication
- Containment Sump Level indication

3.4.6 Thermal-Hydraulic Analyses

STPs thermal-hydraulic analyses concluded that containment temperature and pressure will remain well below design limits and that equipment qualification temperatures for key parameter instruments subject to the containment environment will remain functional indefinitely. The containment temperature is monitored using FSG-05 (Reference 22).

3.5 Alternate Approaches

STPNOC followed the guidance provided in NEI 12-06 with the exception of the Alternate Approaches listed below. These Alternate Approaches were discussed with the NRC review staff during the onsite audit and some are noted in the Onsite Audit Report (Reference 49):

Pre-Staging of FLEX Response Equipment inside Protected Structures

STP pre-staged some of the FLEX response equipment including two DGs in protected structures on top of the MAB roof as well as pumps, hoses, and associated equipment inside existing Class 1 buildings protected against design-basis external events. The primary reason for pre-staging this equipment is due to difficulties in retrieving and deploying equipment following a large-scale flooding event.

Two-Separate Pumps and Injection Pathways for RCS Fill

STP utilizes two pre-staged pumps with separate injection pathways for the FLEX RCS fill strategy instead of a single pump with primary and alternate connection points and injection pathways supplemented by a portable pump. The advantage of this strategy is that the pumps are protected inside safety-related buildings, however, it limits the diversity of connection points to supply water to the pumps.

In the STP strategy, the failure of a pre-staged pump would render one of the two injection pathways unavailable as opposed to the two pathways that would be available using the portable pump strategy. As a compensatory measure, STP reduced the allowed out-of-service time for both the PDP and FLEX RCS makeup pump and their associated connections and flowpaths from 90 days to 30 days to help ensure reliability of this equipment.

The STP FLEX strategies also rely on pre-staged pumps for SG makeup and SFP makeup, however, STP has the ability to makeup to these systems using a portable TMDDP.

3.6 Characterization of External Hazards

3.6.1 Seismic

The peak accelerations associated with SSE and OBE have been established based on the seismicity evaluation described in UFSAR Section 2.5. The peak horizontal acceleration at this site is less than 0.10g. Because this acceleration value is below the minimum established in Appendix A, "Reactor Site Criteria" to 10CFR100, a maximum horizontal acceleration was selected to be 0.10g. The peak horizontal accelerations of 0.10g for SSE and 0.05g for OBE were incorporated in the design response spectra in order to comply with Appendix A, to 10CFR100. The ground acceleration as represented by the spectral acceleration at 33 Hz is 0.1g for both the horizontal and the vertical directions. At 50 Hz the vertical spectral acceleration is reduced to two-thirds of the horizontal acceleration.

In response to the 50.54(f) letter and following the guidance provided in the Screening, Prioritization and Implementation Details (SPID) (Reference 50), a seismic hazard reevaluation was performed for STP Units 1 and 2 (Reference 58). Based on the results of the screening evaluation, the reevaluation shows that the updated GMRS does not exceed the SSE, therefore no further evaluations will be performed.

As described in Section 3.7, "Protection of FLEX Equipment", FLEX storage provides adequate seismic protection.

3.6.2 External Flooding

Section 2.4 of the UFSAR describes the flooding mechanisms evaluated for STP Units 1 and 2. These include local intense precipitation, flooding in streams and rivers, storm surge, seiche, tsunami, and dam breaches and failures including upstream dam failures and the breach of the Main Cooling Reservoir (MCR) embankment.

The current design basis (CDB) flood elevations for the safety-related structures, systems and components at STP 1 and 2 are governed by the maximum flood levels resulting from this postulated breach of the MCR embankment, as documented in Section 2.4.4.3.2 of the UFSAR. The MCR is a major feature of the site, which is formed by a 12.4 mile long earth-fill embankment constructed above the natural ground surface. The MCR has a surface area of 7000 acres with a normal maximum operating level of 49 ft. MSL. A postulated breach of the MCR embankment is not considered a credible event as documented in Section 2.4.4.1.1.3 of the UFSAR. However a very conservative MCR embankment breach analysis was performed.

As a result of the MCR embankment breach, the CDB flood elevations in the power block vary from a minimum of 44.5 ft. MSL at the Diesel Generator Building and the north face of the Mechanical Electrical Auxiliaries Building to a maximum of 50.8 ft. MSL at the south face of the Fuel Handling Building. In the Essential Cooling Pond, the CDB flood elevation was established to be 40.8 ft. MSL at the essential cooling water intake structure (ECWIS).

All safety-related structures and components are designed to withstand the flood levels from these postulated events.

A Flooding Hazard Reevaluation was prepared in response to the March 12, 2012, 50.54(f) letter to provide information on the reevaluation of external flooding hazards at STP Units 1 and 2 using present day methodologies, data and guidance. The reevaluation of external flooding hazards concluded that the highly conservative MCR embankment breaching scenario remains the controlling flooding mechanism for Units 1 and 2, consistent with the design basis flood evaluation in UFSAR. The UFSAR design basis flood levels, between 44.5 and 50.8 ft. MSL at the plant structures (power block area) and 40.8 ft. MSL at the ECW intake structure, remain bounding. For STP Units 1 and 2, the current design basis flood protection measures implemented at the site will provide adequate protection against the reevaluated flood hazards. Based on the results of the reevaluated flood hazards, no interim actions or integrated assessment are necessary.

As described in Section 3.7, "Protection of FLEX Equipment", FLEX storage provides adequate flood protection.

3.6.3 Severe Storms with High Wind

NEI 12-06, Section 7 provides a screening process for evaluation of high wind hazards. This screening process considers the hazard due to hurricanes, tornadoes and tornado missiles.

The screening for high wind hazards associated with hurricanes was accomplished by comparing the site location to NEI 12-06, Figure 7-1. If the resulting frequency of recurrence of hurricanes with wind speeds in excess of 130 miles per hour (MPH) exceeds 10^{-6} per year probability, the site should address hazards due to extreme high winds associated with hurricanes. Based on the location of STP Units 1 and 2, Figure 7-1 shows an applicable hurricane wind speed of approximately 210 mph with an annual exceedance probability of 10^{-6}.

The screening for high wind hazards associated with tornadoes was accomplished by comparing the site location to NEI 12-06, Figure 7-2. If the resulting frequency of recurrence of tornadoes with wind speeds in excess of 130 miles per hour (MPH) exceeds 10^{-6} per year probability, the site should address hazards due to extreme high winds associated with tornadoes. Based on the location (latitude of slightly lower than 29 degrees and longitude 96 degrees) of STP Units 1 and 2, Figure 7-2 shows an applicable tornado wind speed of approximately 161 mph with an annual exceedance probability of 10^{-6}.

Based on these results, the STP Units 1 & 2 site is susceptible to high winds from hurricanes and tornadoes and associated missiles.

The design basis wind speeds for STP Units 1 & 2 safety-related structures are defined in UFSAR Section 3.3. The design tornado parameters includes winds with a combined tangential and translation velocity of 360 mph. The associated wind pressure and tornado missiles listed in this UFSAR section govern the design of these safety-related structures.

FLEX Diesel Enclosure located on the roof of the MAB is designed to meet the maximum of design basis wind loads or wind loads computed in accordance with the latest code requirements including ASCE 7-10, Regulatory Guide 1.76 and Regulatory Guide 1.221.

FLEX Storage Buildings located outside the protected area are designed in accordance with or evaluated equivalent to ASCE 7-10. Distance separation of the buildings address impact of tornadic wind and wind generated missiles.

As described in Section 3.7, "Protection of FLEX Equipment", FLEX storage provides adequate protection from high winds generated from hurricanes and tornadoes and associated missiles.

3.6.4 Ice, Snow and Extreme Cold

STP Units 1 & 2 screens out for extreme cold and snowfall hazard.

- The guidance provided in NEI 12-06, Section 8.2.1, states that plants above the 35th parallel must consider extreme cold and snowfall. STP Units 1 & 2 site is located below the 35th parallel.

- As stated in NEI 12-06, sites in the Gulf Coast do not experience extreme cold conditions, therefore extreme cold is not considered an applicable hazard for STP Units 1 & 2.

- Section 8.2.1 of NEI 12-06 indicates that sites on the Gulf Coast are unlikely to experience extreme snow. NEI 12-06 Figure 8.1, "Record 3-Day Snowfalls", shows that for the area around STP Units 1 & 2, although snow occurs, it does not reach extreme levels. On this basis, extreme snowfall is not considered to be an applicable hazard for STP Units 1 & 2 that would adversely impact equipment deployment. UFSAR Table 2.3-4, "Site / Region Meteorological Extremes" provides information on the snowfall levels in the STP Units 1 & 2 site area, confirming this conclusion.

NEI 12-06, Figure 8.2, "Maximum Ice Storm Severity Maps", shows that STP Units 1 & 2 site is located in Ice Severity Level 3 (Yellow), which is defined as low to medium damage to power lines and/or existence of considerable amount of ice. Section 8.2.1 states that plants with this Ice Severity Level should consider the effects of ice storm impacts.

The STP FLEX strategies do not rely on power lines, and the area is not likely to experience considerable amounts of ice. Per UFSAR Section 2.3.1.2.4, no ice storms were reported within a 50-mile radius of the site for the 1959 to 1972 period. The site area averages less than one day per year with glaze (1950 to 1969). The greatest thickness of ice observed on utility wires during the 1928 to 1937 period (latest data available) in the STP Units 1 & 2 site area was in the range from 0.25 inches to 0.49 inches.

More recent snow and ice storm data was prepared in support of the licensing for STP Units 3 and 4, which would be located nearby STP Units 1 and 2. The data used for Units 3 and 4 is based on the latest version of the Climatic Atlas of the United States (Reference 51), which has been developed from observations made between 1961 and 1990, and the storm events for Texas (Reference 52) based on observations made through March 2007. These references show that any accumulation of snow is a rare occurrence on the Upper Coastal division within the Coastal Prairie region where STP is located, with normal annual totals averaging less than 0.5 in.

According to the NOAA Storm Events database, (Reference 52), the greatest snowfall on record in the STP area was measured at a Danevang, Texas weather observing station located 20 miles north-northwest of the STP site. 24-hour and monthly total station records of 10.5 inches were recorded during the Christmas Storm of 2004 (Reference 52).

Depending on the temperature characteristics of the air mass, snow events are often accompanied by or alternate between sleet and freezing rain or ice. According to the Climatic Atlas (Reference 51), freezing precipitation occurs only approximately 2.5 to 5.4 days per year at the STP site.

The use of four-wheel drive tractors to transport the TMDDPs and associated hose trailers from the FLEX Buildings outside the protected area will handle these limited occurrences of ice. The vast majority of STP's FLEX equipment is pre-staged inside protected structures and deployment of this equipment would not be impacted by ice.

As described in Section 3.7, "Protection of FLEX Equipment", FLEX storage provides adequate protection from extreme ice.

3.6.5 Extreme Heat

Section 9.2 of NEI 12-06 states that all sites must consider the impact of high temperatures. UFSAR Section 2.3.2.1.5 (Table 2.3-4) provides extremes of temperature for six surrounding locations to STP Units 1 & 2. Extreme high temperature ranges from 101 to 107 degrees F.

The tractors and TMDDPs are designed to operate in high heat conditions.

Ventilation for the FLEX Diesel enclosure on the roof of the MAB was designed to maintain interior temperatures below 122 degrees F. All equipment protected by the enclosure can withstand this temperature. The new enclosure on top of the MAB housing the FLEX DGs will also be cooled by natural circulation.

The FLEX Storage Buildings outside the protected area contain no heat source and will be ventilated by natural circulation. The metal doors to the storage buildings can be manually opened and function well in high temperatures.

Plant procedures include considerations for personnel working in high heat conditions including the staging of cool vests. Plant personnel regularly work in areas that are greater than 110 degrees F inside the plant. Plant personnel will be monitored for signs of heat stress using current safety procedures.

As described in Section 3.7, "Protection of FLEX Equipment", FLEX storage provides adequate protection from extreme heat.

3.7 Protection of FLEX Equipment

The vast majority of the equipment needed for the FLEX strategies is pre-staged and protected in safety-related concrete structures as described in Section 3.8 of the UFSAR. As discussed in Section 3.5 of this FIP as well as the STP FLEX Onsite Audit Report (Reference 49), this is considered an Alternate Approach to the NEI 12-06 guidance. However, these permanent plant safety-related structures are designed to protect the FLEX equipment from all external hazards including seismic (SSE), external flooding, high winds, missile impact, snow, ice, extreme cold and extreme heat.

A steel enclosure has been added in each unit on the roof of the MAB for protecting and housing the FLEX diesel generators, fuel oil tank and electrical distribution panel. The enclosure is designed to protect the FLEX equipment from all external hazards including seismic (SSE), external flooding, high winds, missile impact, snow, ice, extreme cold and extreme heat.

The specific design characteristics of the enclosures are presented in STP Calculation SC-05018 (Reference 53). The Design Change Package (DCP) for the Unit 1 enclosure is DCP 12-11658-28 (Reference 54) and DCP 12-11658-27 for the Unit 2 enclosure (Reference 55). These enclosures meet the NEI 12-06 requirements for robustness. See Figure 3.7-1, below, for a photo of one of the FLEX DG enclosures.

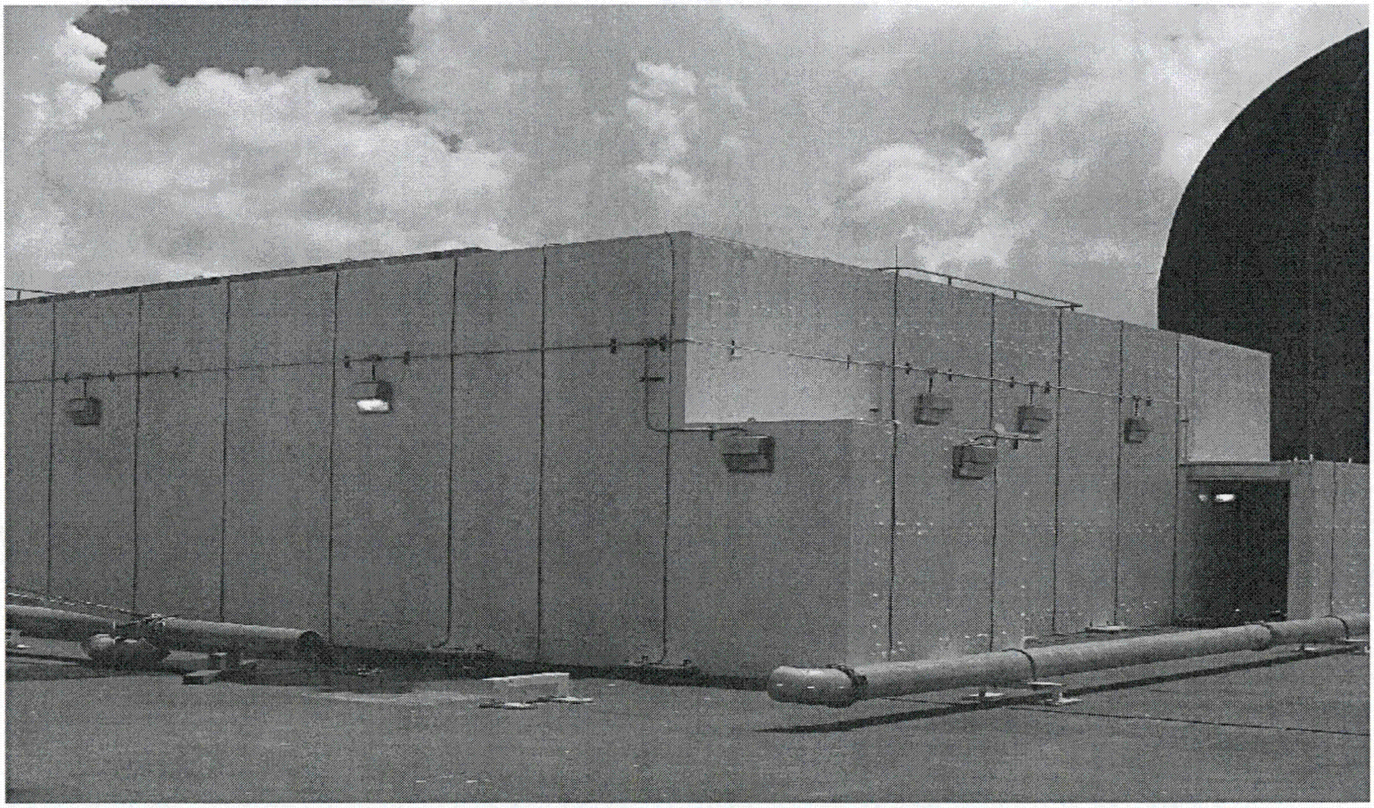

Figure 3.7-1 – FLEX DG Enclosure, Unit 2

<u>FLEX Storage Buildings</u>

The two FLEX Storage Buildings located outside the PA house four-wheel drive tractors, TMDDPs and associated hoses and trailers. The locations of the buildings are sufficiently separated so that there is assurance that at least one of the buildings would survive the applicable site hazards, such as a tornado and flood.

The FLEX storage building located on the MCR embankment intermediate level is a pre-engineered metal building designed to meet the following:

- ASCE 7-10 for seismic capability
- Design basis for wind load
- High temperature - the building contains no heat load and it will be ventilated by natural circulation
- Cold temperature - addressed through use of anti-freeze in the tractors and motors for the TMDDPs
- Hazards due to tornadoes and flood are addressed by separating the buildings by over a mile apart and locating them at different elevations

A portion of the Low Level Radwaste (LLRW) Building serves as the FLEX storage building for the other set of equipment. It is a pre-engineered metal building designed to meet the following:

- ASCE 7-05 for seismic capability – seismic protection evaluated equivalent to ASCE 7-10
- Design basis for wind load
- High temperature - the building contains no heat load and it will be ventilated by natural circulation
- Cold temperature - addressed through use of anti-freeze in the tractors and motors for the TMDDPs
- Hazards due to tornadoes and flood are addressed by separating the buildings by over a mile apart and locating them at different elevations

Note that the LLRW Building was built prior to the FLEX effort under ASCE 7-05, not ASCE 7-10. An engineering review was performed to address the difference in code requirements (ASCE 7-05 versus ASCE 7-10). The study concluded that for this area of the U.S. and for this particular building, the differences will not adversely affect the structural and foundation performance (Reference 56).

Seismic Survivability of FLEX Storage Buildings

NEI 12-06 was used to establish requirements for the storage of FLEX equipment. Section 5.3.1 listed acceptable options for storage, one of which was to house the equipment in a building designed equivalent to ASCE 7-10. STP implemented this guidance for the design and analysis of the two FLEX Storage Buildings.

The STP FLEX strategy includes storage of equipment in two non-Category 1 one-story metal buildings located outside the Protected Area. These structures were designed or evaluated equivalent to ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures", which is one of the acceptable methods identified in Section 5.3.1 of NEI 12-06.

In response to a question to the industry from the NRC regarding seismic survivability of the FLEX Storage Buildings, STP completed an engineering evaluation that determined that another load case, wind loading, governs the storage building designs such that they would be functional following an SSE (Reference 57).

The STP Engineering evaluation confirmed that the wind forces used in the design significantly exceed SSE seismic forces. This is a consequence of the relatively low mass of the one-story buildings, the low seismicity of the Texas Gulf Coast region, and the relatively high wind forces in this region. The engineering evaluation estimated SSE seismic forces using the static equivalent method of seismic analysis and 1.5 times SSE peak acceleration. Therefore, even though SSE was not used in the design of the buildings, the higher wind forces that were used guarantee that the buildings will survive the STP design basis (SSE) earthquake.

Note also that at STP the reevaluated seismic spectra (GMRS) is lower than SSE, as established in STP's Seismic Hazard and Screening Report (Reference 58).

The design of the buildings for high wind loads makes them capable of withstanding the smaller lateral forces that would occur during an earthquake characterized by SSE. Since the SSE bounds the GMRS, both buildings are confirmed to withstand both SSE and GMRS seismic loads.

3.8 Planned Deployment of FLEX Equipment

The only FLEX equipment that must be deployed into the PA are the TMDDPs and associated hoses and trailers that are primarily used to move water to the AFWST and the RWST. The TMDDPs will be deployed when personnel are available but is required when AFWST level lowers to less than 177,000 gal per EC00.

The TMDD pumps are pulled using four wheel drive tractors with front end loaders. The tractors are stored with the pumps and hose trailers in the two FLEX buildings. Two haul paths are available for the tractor stored in the LLRW Building and three haul paths are available to the tractor stored on the east side of the MCR. The front end loaders will be used for debris removal if necessary.

In Phase 3, the NSRC will provide additional equipment such as pumps and generators to be used as needed. Both the site FLEX TMDDPs and the NSRC pumps will be situated near the water source to limit the length of the suction hose required.

3.8.1 Haul Paths

The haul paths for transporting the TMDDPs into the PA to their deployment locations have been reviewed for potential soil liquefaction and were determined to be stable following a seismic event. Soil liquefaction is discussed in UFSAR Section 2.5.4.8.1.5, which states that liquefaction will not occur in the plant area during the SSE.

Additionally, the haul paths minimize travel through areas with trees, power lines and narrow passages to the extent practical. High winds can cause debris from distant sources to interfere with planned haul paths, so debris removal equipment (four wheel drive tractors with front end loaders) is stored inside the FLEX Storage Buildings to clear obstructions from the pathway between the storage buildings and their deployment location(s).

The haul paths from the FLEX Building located east of the MCR are as follows:

- Top of reservoir embankment road that heads directly to the plant from the east
- Top of reservoir embankment road that goes around the reservoir and approaches the plant from the west
- Down reservoir embankment to the heavy haul road

Depending on the type external event, one of these haul paths should be available.

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. Delivery of this equipment is discussed in Section 3.10 of the FIP.

The same debris removal equipment used for the haul paths may also be used to support debris removal to facilitate road access within the site boundaries.

3.8.2 Accessibility

Potential access impairments consist primarily of doors in Phases 1 and 2 and PA access gates in Phases 2 and 3. These doors and gates are typically controlled to maintain their function as barriers during normal operations.

Following a BDBEE and subsequent ELAP, FLEX coping strategies may require the routing of hoses and cables through normally closed barriers in order to connect FLEX equipment to station water and electric systems, as well as for ingress and egress and ventilation. Certain barriers (gates and doors) will be opened and remain open for the duration of the event (Reference 21). This departure from normal administrative controls is acknowledged by Security and is acceptable during the implementation of FLEX coping strategies.

The Shift Manager will distribute keys as necessary to personnel to permit opening of Security doors during an ELAP event (Reference 21).

Vehicle access to the PA occurs via the East Gate Entrapment. As described in FSG-06, Security is contacted to open the East Gate Entrapment to allow delivery of TMDDPs, tractors and hose trailers into the PA.

3.8.3 Deployment Limitations for the FLEX TMDDPs Due to Flooding

It is clearly stated in the UFSAR that a breach of the MCR embankment is not considered a credible event. Many conservatisms were contained in the analysis including the assumption of an instantaneous removal of approximately 2000 linear feet on the embankment, as stated in UFSAR Section 2.4.4.1.1.3.

In order to get a better understanding of the site conditions that would be expected following the very unlikely event of a failure of the MCR embankment, a more realistic breach analysis was performed in 2012 by Atkins (Reference 59). Results of this 2012 MCR embankment breach analysis were used to determine flood levels on site at various time intervals after the event.

One of the FLEX scenarios utilizes TMDDPs to pump water to the AFWST and the RWST. The input from the 2012 breach analysis was used in developing time lines for implementing the use of the TMDDPs.

3.9 Fueling of Equipment

The diesel consumption for the first seven days of the BDBEE will not deplete our ESF DG FOSTs. The fuel oil that will be used for these strategies is compatible with all the various FLEX diesel components.

The three ESF DG FOSTs each contain at least the TS limit of 60,500 gal per unit, yielding a minimum of 181,500 gal of fuel oil per unit that is protected from external events. The fuel oil that STP uses for all FLEX diesel driven components will be stored in these tanks.

Each FLEX DG will use 54 gallons per hour at 75% load and 70 gallons per hour at full load. The FLEX DG has a protected 660 gal fuel oil tank that will allow over eight hours of fully loaded run time before requiring refueling. Approximately 12 hours into the event, preparations will be underway to begin the refill effort. In each ESF DG bay, there is a 1 inch fuel oil sample line that will be used to install a suction hose fitting. The suction hose will be attached to a 120V FLEX fuel oil transfer pump stored in a FLEX locker on the EAB 86' elevation. A discharge hose will be lowered from the roof of the EAB and attached to the fuel oil transfer pump. The hoses will also be stored in the EAB 86' elevation. Power for the pump will come from a receptacle on the 35' elevation of the EAB in the Control Room. An extension cord for connecting the receptacle to the pump is also stored in the EAB 86' elevation. These actions are described in FSG-19 (Reference 32).

Refueling the TMDDPs will not be required until more than 24 hours after the start of the event. To refuel these pumps, the hose used to fill the FLEX DG FOST will need to be lowered to ground level (29 ft elevation), east of the DGB to facilitate refueling any portable equipment (Reference 32). When the NSRC refuel equipment arrives on site, it can also be used to move fuel from the ESF DG FOSTs to the TMDDPs.

The following fuel consumption approximations are documented in the acceptance test packages in the applicable work orders:

- The FLEX DG uses approximately 70 gallons per hour at full load (1,680 gallons per day)
- The TMDDPs use approximately 15 gallons per hour at full load (360 gallons per day)

Per the SAFER guideline, the two NSRC Marine turbine generators use approximately 110 gals/hr each (5280 gallons per day).

Given these fuel consumption approximations, the minimum of 181,500 gallons of fuel in the ESF DG FOSTs plus the 660 gallons of fuel in the FLEX FOST, STP will has sufficient fuel to operate under these conditions for approximately 25 days per Unit.

3.10 Offsite Resources

3.10.1 National SAFER Response Center

The industry has established two NSRCs to support utilities and provide supplemental equipment during BDB events. STP has established contracts with the Pooled Equipment Inventory Company (PEICo) for support of the NSRCs, as required. Each NSRC will hold five sets of equipment, four of which will be able to be fully deployed when requested with the fifth set of equipment in a maintenance cycle. In addition, onsite BDB equipment hose and cable end fittings have been standardized to be compatible 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 directly to the STP site staging area. In the event that the onsite staging area is not available, the NSRC will be directed to send the equipment to a local assembly area established by the SAFER team. These alternate staging areas are in Bay City, approximately 30 minutes from the STP and near Wharton, approximately one hour from the STP. Equipment can be taken to the STP site from the offsite staging areas and staged at the SAFER onsite Staging Area "B" on the west side of the plant by ground or helicopter if ground transportation is unavailable.

See Figure 3.10.1-1 and Figure 3.10.1-2, below, for travel paths from the offsite staging areas to STP.

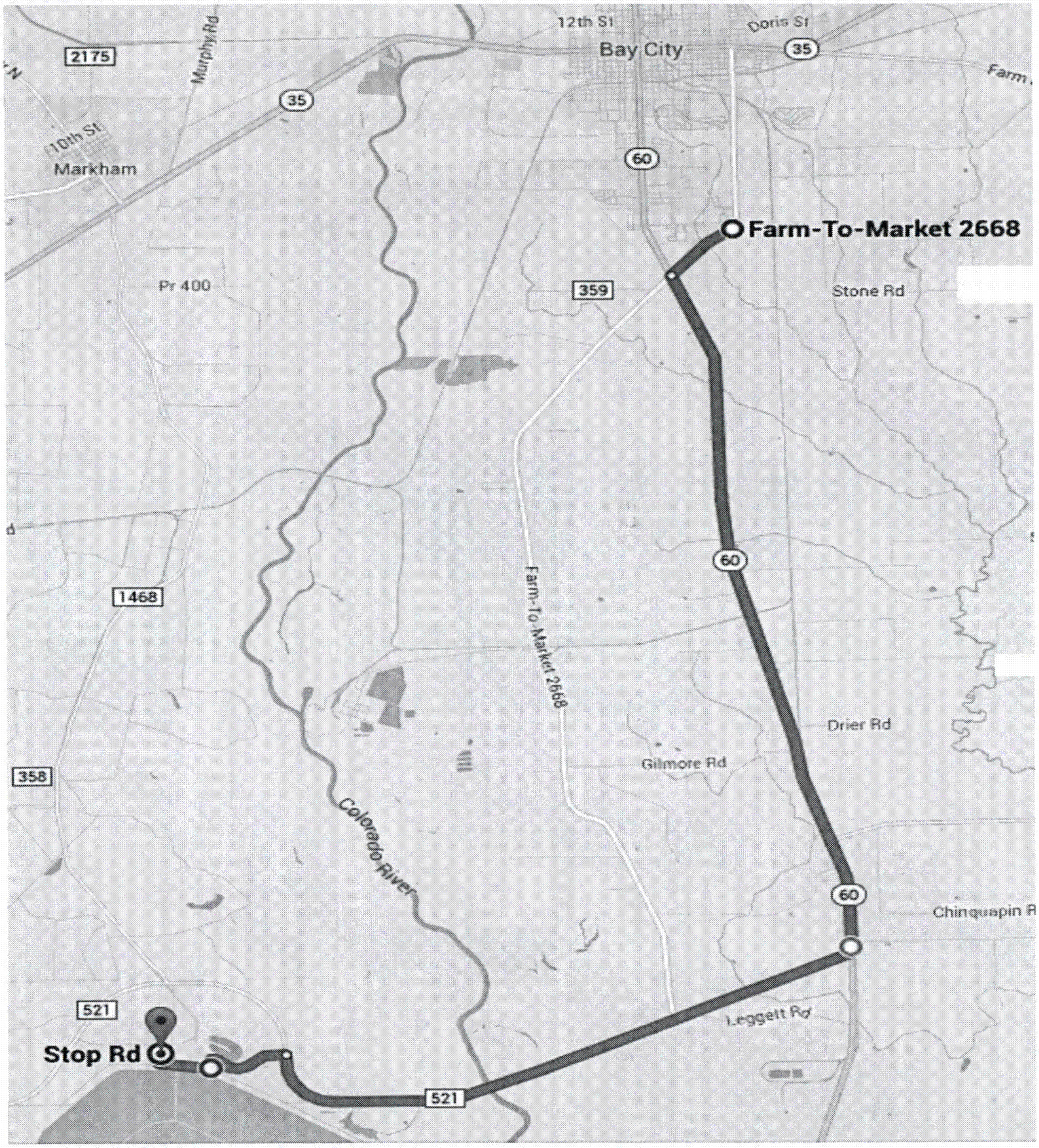

Figure 3.10.1-1 – Travel path from Bay City off-site staging area to STP

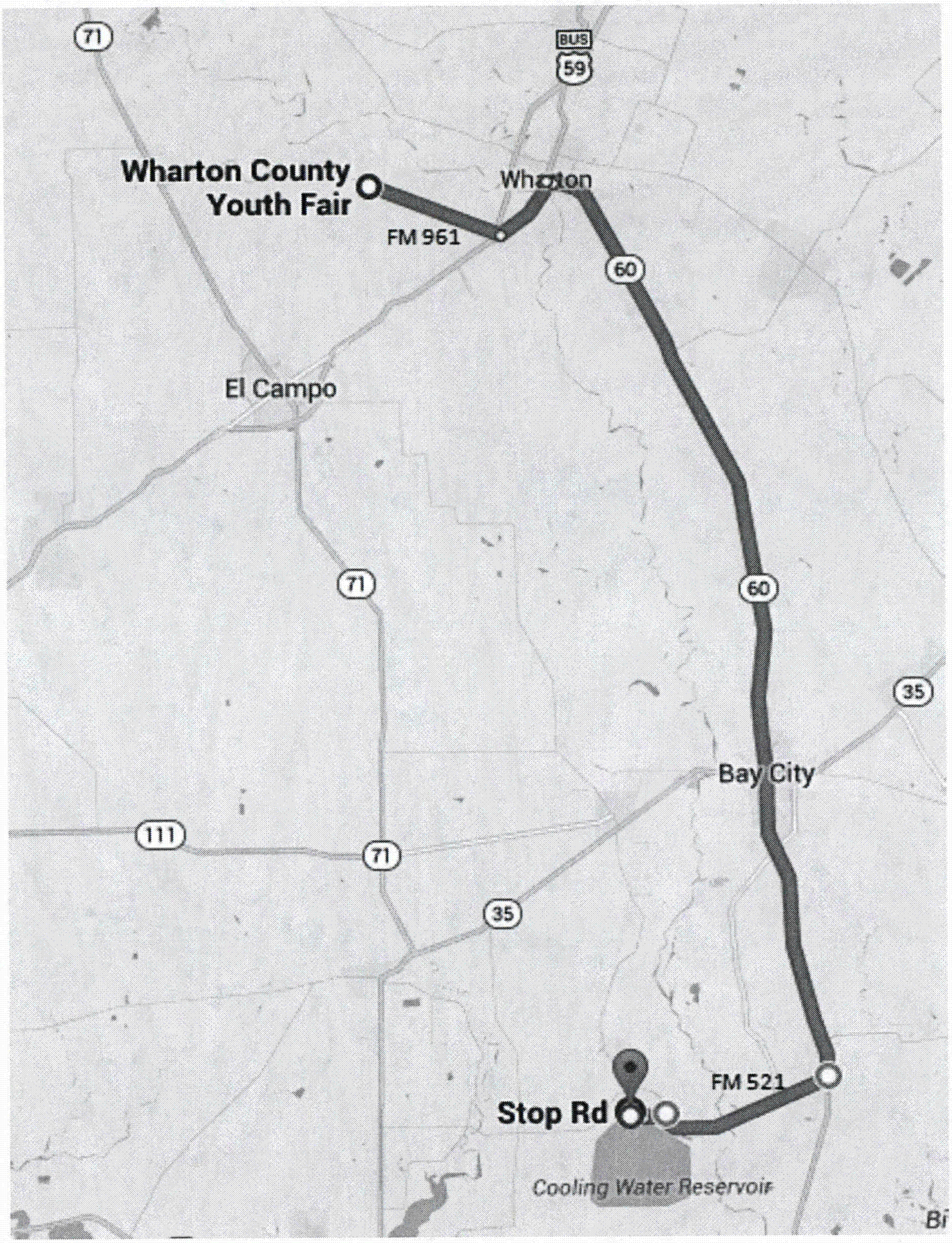

Figure 3.10.1-2 – Travel path from Wharton off-site staging area to STP

Communications will be established between STP and the SAFER team using satellite phones, helping required equipment to be moved to the site as needed (Reference 22). The NSRC equipment will begin to arrive on site within 24 hours from the initial request.

3.10.2 Equipment List

The equipment stored and maintained at the NSRC for transportation to the local assembly area to support the response to a BDB external event at STP is listed in Table 3.10.2-1, below. Table 3.10.2-1 identifies some of the equipment that will be available for backup and replacement purposes should onsite equipment be unavailable. Only the 4160 VAC generator is credited in the FLEX strategies (Reference 19). Emergency response personnel can use the backup equipment as needed to enhance implementation.

Portable Equipment	Use and (Potential / Flexibility) Diverse Uses					Notes	Performance Criteria	
	Core Cooling	Cont. Cooling/ Integrity	Access	Instrumentation	RCS Inventory			
Medium Voltage Generators	X	X		X	X	FSG-21	4160 VAC	1 MW
Low Voltage Generators						Potential backup for defense-in-depth	480 VAC	1 MW
High Pressure Injection pump					X	Potential backup for defense-in-depth	2000 psig	60 GPM
SG Makeup pump	X					Potential backup for defense-in-depth	500 psid	500 GPM
Low Pressure / Medium Flow pump	X	X				Potential backup for defense-in-depth	300 psid	2500 GPM
Low Pressure / High Flow pump						Potential backup for defense-in-depth	150 psid	5000 GPM
Lighting Towers			X			Potential backup for defense-in-depth	--	40,000 Lumens
Diesel Fuel Transfer Tank	X	X	X	X	X	Refuel equipment for 4160 VAC generator	--	1247 gal
Diesel Fuel Transfer Tank & Pump	X	X	X	X	X	Refuel equipment for 4160 VAC generator	--	264 gal

Table 3.10.2-1 – List of equipment provided by the NSRC

3.11 Equipment Operating Conditions

3.11.1 Ventilation and Habitability

Some plant locations where FLEX equipment is stored have heat loads and little to no ventilation until the FLEX DGs are put into operation and begin powering equipment. Natural circulation and the proceduralized propping open of doors are the initial capabilities for room cooling. There will be no forced ventilation anywhere in the plant until the FLEX DG is powering equipment. STP performed evaluations on the most critical areas and equipment to ensure equipment survivability and area habitability.

The EAB Heatup Calculation NAI-1646-001 (Reference 47) with supporting input calculation NC-07091 (Reference 93) evaluates ELAP heatup in critical portions of the EAB, primarily the QDPS and inverter rooms.

Heatup calculations for the QDPS cabinets and the Class 1E inverters show that prior to 24 hours into the event the room doors will need to be opened for ventilation. After opening the room doors, the cabinets and inverters will not reach their high temperature limit for an additional three days at which point forced ventilation will have been established.

STP's calculations demonstrate that running the TDAFW pump during an ELAP event will not cause the TDAFW pump room to heat up beyond the pump Environmental Qualification temperature limit of 170°F (Reference 60). However, operators will be directed to the IVC early in the event to lineup Auxiliary Feedwater to all SGs. FSG-05 directs operators to open the door to the TDAFW pump room to allow the heat being generated in the room to dissipate into the hallway, up the stairwell and out of the IVC. Once the FLEX DG is in operation, the TDAFW Cubicle Vent fan can also be started. The FLEX SG makeup pumps in the IVC bays also have cubicle vent fans that can be started when the FLEX DG is powering DP1000, which provides power to the cubicle vent fan MCC (Reference 22).

The rooms containing the SG PORVs and the TDAFW pump are at elevated temperatures. STP has cool vests stored inside a FLEX storage locker in the EAB on the 86' elevation for personnel use in these rooms and for other FLEX strategies, if necessary.

Additionally, as part of STP's loss of EAB HVAC Procedure (Reference 61), portable ventilation fans are pre-staged in the EAB on the 10', 60' and 86' elevations to be used if ventilation is lost. The loss of EAB HVAC procedure also directs the placement of these fans and identifies which doors to prop open for best circulation of air (Reference 61).

During an ELAP, Control Room ventilation will be lost, however, the Control Room heat loads will be simultaneously reduced. The DC load shedding actions completed during the first two hours of the event per FSG-04 (Reference 30) de-energizes equipment in the Control Room and the adjacent relay room. The remaining heat sources in the Control Room are primarily generated by personnel, emergency lighting, and remaining QDPS instrumentation. Although the ELAP heat-up calculation performed by STP (References 47) does not specifically model heat-up in the Control Room, the calculations show that temperature response in the critical rooms is relatively slow, requiring over 24 hours before temperature limits are approached and action is taken to open doors. The calculation models the Control Room as an adjacent heat sink and assumes Control Room temperature starts at 78°F and increases linearly over the next eight hours to 104°F. This is a reasonable assumption based on the limited heat sources remaining in the Control Room and its relatively large air volume (approximately 91,000 ft^3).

The FLEX DG is projected to be started three hours following the start of the ELAP event. Actions to connect cables to MCC E1A2(E2A2) are projected to start between 30 and 90 minutes following event start. After MCCs E1A2(E2A2) and E1C2(E2C2) are energized, communications equipment, lighting, and battery chargers are energized via the FLEX DG and the safety-related Control Room Return Fan 11A(21A) may be started per FSG-05 (Reference 22). Actions to connect cables to MCC E1B4(E2B4) are projected to be performed before 4.5 hours following event start. An additional Control Room Return Fan 11B(21B) can then be started to increase outside air flow to the Control Room.

3.11.2 Heat Tracing

Heat trace circuits keep the 4-weight-percent boric acid at approximately 85°F. When the ELAP occurs, the water temperature will slowly lower but will not decrease past 55°F because the tanks and piping are insulated and inside concrete buildings. When the FLEX DG is running, the Boric Acid pumps will be started when the boric acid piping temperature is less than 65 degrees F. The pumps recirculate the solution in the BATs to ensure the temperature does not continue to lower to the point where boric acid begins to solidify. In the unlikely event that the boric acid begins to solidify early, suction source transfer from the BATs to the RWST can be started per FSG-08 or FSG-01 (References 33 and 62).

3.12 Lighting

Lighting for the Control Room and other vital areas is provided by Appendix R battery-powered lights for at least eight hours following the ELAP event; these lights are not qualified to operate following a design basis seismic event but they all have seismic II/I restraints. There are over 220 such fixtures in each unit at fixed locations. In the event that the Appendix R lighting is damaged at these locations, each unit has three lanterns for a backup lighting source located in the hallway next to the Control Room. Additionally, Operators are required to carry flashlights with them at all times and handheld navy battle lanterns are stored the EAB and MAB. The battle lanterns contain LEDs and should last approximately 32 hours (Reference 88). Table 3.12-1, below, lists the locations of the handheld battle lanterns.

TAG/TPNS	Appendix R	Location	Room
7E561ELG0348L	Y	EAB	010
7E562ELG0348L	Y	EAB	010
7E561ELG0309L	Y	EAB	212
7E562ELG0309L	Y	EAB	212
7E561ELG0278L	Y	EAB	318
7E562ELG0278L	Y	EAB	318
7E561ELG0385L	Y	MAB	326
7E562ELG0385L	Y	MAB	326

Table 3.12-1 – Locations of Appendix R backup battle lanterns

Other portable lighting sources are stored in a designated FLEX locker that is protected from external hazards and easily accessed in the EAB.

Six new battery-backed light fixtures have been installed in each FLEX DG enclosure to enhance visibility for personnel starting the generators. Once the FLEX DG has been started, Power from the FLEX DG Switchgear will be routed from the MAB roof to two manually operated transfer switches to allow the powering of the lighting transformers should the primary source fail during a BDBEE. The transfer switches will be located in the vicinity of the lighting panel transformers on the 35' elevation of the EAB. The cables from the FLEX Distribution Panel to Transfer Switch will be routed in conduit and existing non-Class IE cable trays. The remaining cables will be routed in conduits. A cable will be connected to provide FLEX power from both manual transfer switches. Existing cables from the MCCs to the lighting transformers will be pulled back and routed to the new transfer switches. The downstream lighting transformers LP14L and LP14U (EAB Elevation 35') will be powered from the FLEX DG per FSG-05. The manual transfer switches will be located in the vicinity of the lighting transformers for the panels LP14L and LP14U. Power from the FLEX DG Switchgear will be routed from the MAB roof to fused disconnect switches upstream of the MCCs (MCC E2C2 and MCC E2A2) for the panels LP14N and LP14M (EAB Elevation 60') to allow powering from the FLEX DG. The fused disconnect switches will be located in the vicinity of MCC E2C2 and MCC E2A2.

See Figure 3.12-1, below, for a photo of a lighting panel power transfer switch.

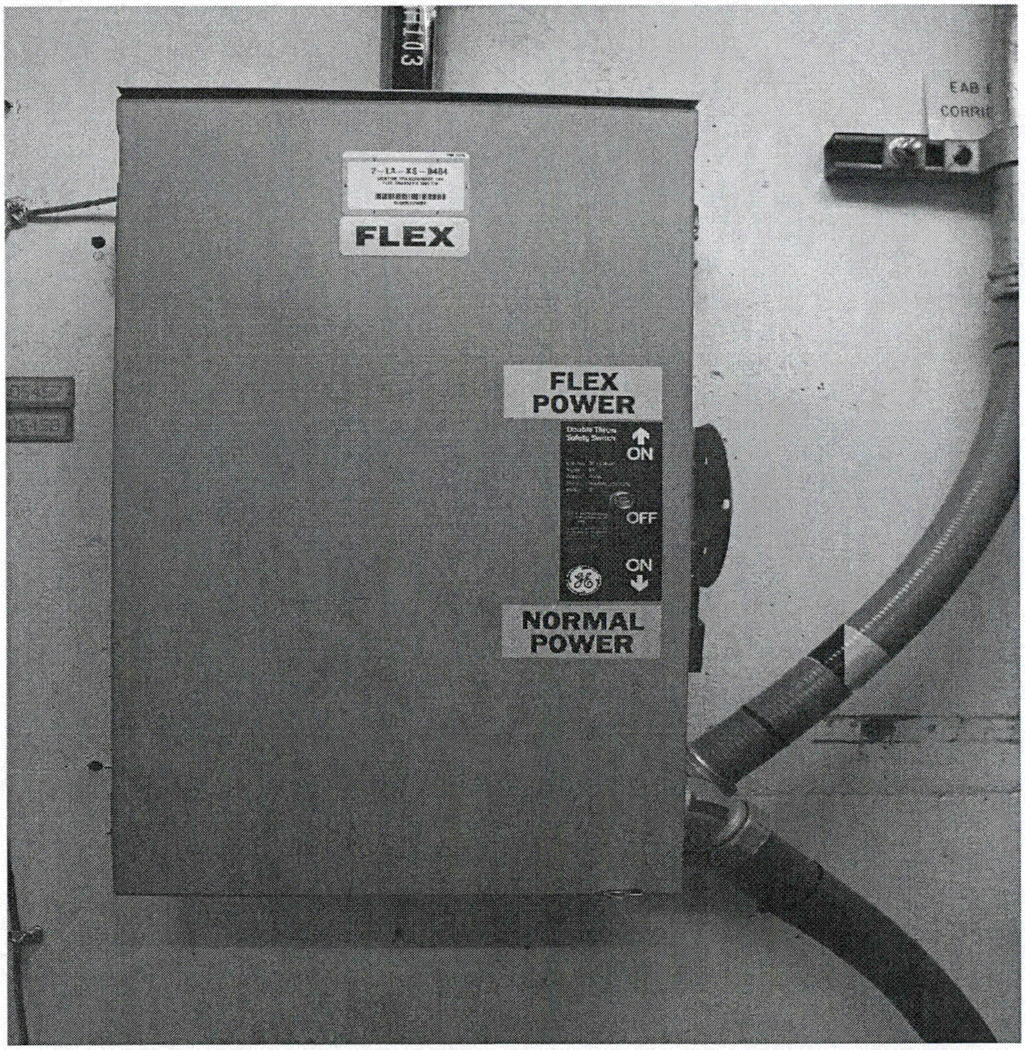

Figure 3.12-1 – FLEX lighting panel transfer switch

There are numerous 120 VAC receptacles that will also be powered by the FLEX DG. At this point, Appendix R fixtures, those are fed from aforementioned lighting panels, throughout all elevations of the EAB will be re-powered and returned back to charge/standby mode. DCP 12-11685-34 and 12-11685-80 provide FLEX power to these lighting panels (Reference 63). LPE-14L provides over twenty 120 VAC power receptacle circuits for the Control Room and also a number in rooms surrounding the control room, such as such the kitchen area and briefing areas in EAB. LPE-14U provides power to a large number of Exit signs in EAB and to a large number of Appendix R light receptacles. LPE-14M and 14N provide lighting in Main Control Room and EAB switchgear rooms, hall wall and Inverter/Battery rooms for all Trains.

In Phase 3, the NSRC will bring light towers to STP which can be placed around the site as needed.

3.13 Communications

As a result of the Recommendation 9.3 Communications Assessment (References 64 and 98), communications at STP were upgraded as follows:

- Additional sound powered head sets and cords
- Additional hand-held satellite phones and chargers
- Additional radios and chargers
- Bullhorns
- Replacement antennas for the hardwired satellite phones.
- Modifications were made to enable the hardwired satellite phone in the Technical Support Center (TSC) to be moved into the Main Control Room (CR) during the ELAP event thereby providing two hardwired satellite phones in the CR.
- Storage of this equipment is inside the power block, protected from external events. These communication strategies are discussed in FSG-05, Initial Assessment and FLEX Equipment Staging.

In addition, the Lossy Loop amplification system can now be powered by FLEX power thus enabling radio communications throughout the plant including inside buildings on two channels.

Phase 1

STP plant communications capabilities include multiple technologies and redundant power supplies. In the event of massive system failures, onsite and offsite communication requirements will continue to be met with the combination of sound powered phones, satellite phones, and radios that will work in line of sight. The sound powered phones are staged throughout the plant inside the power block.

There is one hardwired satellite phone in each Control Room and one in each TSC with hard wired antennas on the roof of the EAB. Per FSG-05, the hard wired satellite phone normally located in the TSC will be moved into the Control Room following a BDBEE (Reference 22). For the permanent satellite phone in the Control Room and the TSC, replacement antennas are stored in protected locations in the EAB in the event that both installed antennas are damaged during the event. There are also two additional hand held satellite phones in the EAB 35' elevation to be used as necessary. During Phase 1, sufficient batteries are available to power plant radios and satellite phones until the FLEX 480V DG is available to supply power to the radio and phone chargers.

Phase 2

Once the FLEX DG has been started and begins providing power to lighting panels LPE-14M and LPE-14N, the Lossy Loop Amplifiers will be receiving power. Until the Lossy Loop is powered, the radios will only work for line-of-sight communications. Two radio channels have been modified so that they will function once the Lossy Loop is powered - One channel is designated for use by Security and the other channel is designated for Operations and Maintenance. The Control Room operators will bring a hand-held radio into the Control Room to use during the event since the Quintron system is without power. Each unit has also been provided with a bull horn stored in the FLEX storage lockers to assist with public address-type communications.

3.14 Shutdown and Refueling Modes Analysis

The units will be at full power for the majority of any operating cycle, which is the most limiting condition for scenarios in which the SGs are available for core heat removal. The same general FLEX approaches can also be used at reduced power and in lower modes when the SGs are intact (Modes 1-4). At reduced power, the plant thermal response will be slower and less severe. In lower-power modes, the additional time for the RCS to heat up to the point at which decay heat can be removed by the SG PORVs will not invalidate or challenge the overall FLEX strategies.

FLEX strategies are not explicitly designed for outage conditions due to the small fraction of the operating cycle that is spent in an outage condition, generally less than 10%. Requirements for FLEX strategies in outage conditions are described in a NEI position paper (Reference 65) which was subsequently endorsed by the NRC (Reference 66). Due in part to the large and diverse scope of activities and configurations for any given nuclear plant outage (planned or forced), the paper concluded that a systematic approach to shutdown safety risk identification and planning is the most effective way of enhancing safety during shutdown. The NEI position references concepts established for outage planning and control including integrated management, level of activities, defense-in-depth, contingency planning, training, and outage safety review. In particular:

- Contingency plans should be available when entering a higher risk evolution.
- Contingency plans should be developed when system availability drops below planned defense in depth.
- Contingency plans should consider use of alternate equipment to respond to loss of dedicated safety and monitoring equipment, and should consider additional monitoring or controls to minimize the potential for unplanned equipment unavailability.
- Personnel who may be required to implement a contingency plan should be familiar with the plan.

3.14.1 Core Cooling and RCS Inventory Control

With no SGs available, RCS water will begin to evaporate as a means to transfer core decay heat to the containment. The primary, N, strategy for RCS makeup is to pump water from the RWST by aligning a FLEX Shutdown RCS makeup pump (170 gpm at 100 psig) to take suction from the RWST and discharge to an RCS cold leg. The FLEX Shutdown RCS makeup pumps are located in the SI bays on the -29 ft elevation of the FHB. The alternate, N+1, strategy is identical to the primary except that the pump and connection points are located in a different SI bay and train and connects to different SI piping. The N pump and connections are located in the A-Train SI bay, and the N+1 pump and connections are located in the B-Train SI bay.

For this shutdown mode FLEX strategy, the reactor is assumed to have been shut down below Mode 3 for a minimum of 30 hours following an operating cycle which represents the approximate minimum time required to cooldown the plant for normal offload of spent fuel with the SGs isolated for planned maintenance. Additionally, both the RCS and the Containment are assumed to be vented because they are vented the majority of the time during Modes 5 and 6. Makeup requirements in this time frame are approximately 143 gpm (Reference 67) which can be supplied by one of the FLEX RCS makeup Pumps. The 170 gpm at 100 psig FLEX RCS makeup pump will provide the required 143 gpm plus an additional 27 gpm for boron flushing as required by NEI 12-06.

3.14.2 SFP Strategy

During shutdown and refueling operations, the time to reach 200°F and the heat-up rate of the SFP as a function of time following a loss of SFP cooling are provided in the Plant Curve Book Figures 5.19B and 5.13B, respectively, for each Unit. The maximum heat load for a typical refueling operation occurs at the end of a full core offload, typically greater than seven days after the reactor shutdown. Assuming this full core heat load at seven days coincident with a loss of cooling, the SFP would begin to boil approximately five hours following the ELAP/LUHS event.

In this scenario the SFP boil-off rate would be about 93 gpm, well within the makeup capability of the RMW pump (300 gpm) and FLEX SFP makeup pump (250 gpm). The SFP would boil down from the normal operating level to 10 feet above the top of the active fuel in approximately 33 hours following the loss of cooling (Reference 46). Maintaining the water level greater than 10 feet above the active core should limit the maximum radiation dose to 2.5 millirem per hour for personnel (Reference 102).

3.14.3 Containment Strategy

With no SGs available, once through cooling will be used to transfer core decay heat to the containment. Without containment heat removal systems available, containment pressure and temperature will rise. Containment venting may be required to prevent exceeding the containment pressure limit. During Phases 2 and 3, containment will be vented as necessary using FSG-12 (Reference 48).

Containment is usually vented during outages, but in the event it was not vented, the actual strength of the containment is considerably higher than the conservatively chosen static design pressure of 56.5 psig stated in Section 3.8.1.3.1 of the UFSAR (Reference 44). Per ASME Code, the STP containments were physically tested to 115% of design pressure (65 psig) and the calculated ultimate strength is 141 psig (Reference 89).

3.15 Sequence of Events

Table 3.15-1, below, presents the Sequence of Events Timeline for an ELAP/LUHS event at STP. The times listed in the Table below are approximate and were generated from the relevant FLEX calculations and EOP actions. The times below are assumed in the calculations and do not necessarily represent the minimum times that the actions can be accomplished.

Event	Time	Comments
Loss of All AC Power	0	
Reactor Trip	0	
TDAFW Pump feeds D-Train SG	1 min	
Operators enter 0POP05-EO-EC00	2 min	
RCP Leakage increase to about 16.5 gpm	4 min	
Transfer SG PORVs to Control Room control	10 min	
ELAP decision point	30 min	Determine if in an ELAP condition; initiate FSG-04 and FSG-05
Strip ESF Load Sequencers	30 min	
Operators complete cross connecting AFW to all four SGs	40 min	Required for symmetric RCS cooldown
Operators initiate SG depressurization to approximately 405 psig	1 hr	Minimize RCP seal damage from high temperature water
PRT ruptures	1.25 hrs	Releases RCS fluid to containment
FLEX DC load shed completed	2 hrs	Ensures at least 8 hrs of battery life
SGs depressurized to ~405 psig	2-3 hrs	Ensures no N_2 injection from accumulators
Boron from SI Accumulator precludes criticality for Xenon-free condition for Phase 1	5 hrs	Time includes 1 hr delay for boron mixing under natural circulation flow conditions
Offsite personnel resources begin to arrive onsite	≥ 6 hrs	Provides additional manpower
END PHASE 1 (relying on Design Basis Equipment) at ≤ 8 hrs		

Table 3.15-1 – FLEX Sequence of Events Timeline (page 1 of 2)

Event	Time	Comments
FLEX DG started and power available to FLEX Equipment	8 hrs	Operations to have the FLEX diesel available within 8 hrs
A and C battery chargers begin charging batteries	8 hrs	
Power/close SI Accumulator valves	≤ 10 hrs	Accumulator valve closure allows continued cooldown
Initiate RCS Makeup	10 hrs	CVCS PDP is the primary
Initiate second SG cooldown	10 hrs	Using SG PORVs
SG makeup pump lined up and placed in service	10 hrs	Will be required prior to TDAFW unavailable due to low SG pressure
RCP Seal leakage terminated when RCS pressure drops to <135 psig	12 hrs	PSV-3200 resets
SFP Makeup commenced using RMW pump depending on SFP level	12 hrs	
Open Reactor Head Vents.	15 hrs	Maintain RCS pressure
Reactor Head reached 100% head level, close head vents 30 min later	21 hrs	Ensure upper head cooling
Maintain RCS pressure using pressurizer PORVs and head vents	22 hrs	
Pressurizer level restored. Secure RCS makeup pump.	23 hrs	Plant is in a steady state mode
Prepare to fill AFWST & RWST as necessary	24 hrs	Will require moving TMDDP(s) and trailers
END PHASE 2 (relying on DB and FLEX equipment)		
Continue coping using Phase 1 and 2 equipment and equipment from NSRCs	24+ hrs	
Connect NSRC 4160 V Turbine Generator to one ESF electrical bus	24+ hrs	

Table 3.15-1 – FLEX Sequence of Events Timeline (page 2 of 2)

3.16 Programmatic Elements

3.16.1 Overall Program Document

STP developed an overall program document that provides a historical description of the FLEX Program (Reference 68). The revised FLEX strategies and information are contained in this FIP.

The program elements provided in the Program Document include:

- Description of the FLEX strategies and basis,
- Provisions for documentation of the historical record of previous strategies and the basis for changes,
- The basis for the maintenance and testing programs chosen for the FLEX equipment, and
- Designation of the minimum set of parameters necessary to support strategy implementation.

Existing design control procedures have been revised to ensure that future changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies. STP's procedure for making design changes has been updated to include screening for impacts to FLEX strategies. As stated in the procedure, all changes affecting the SSCs listed below must be evaluated to ensure that they do not affect any of the FLEX strategies and associated time estimates to complete the strategies (Reference 90):

- Fukushima Response (FR) system or components
- Normal travel paths inside the power block
- Vehicle travel paths inside the PA
- TSC or Control Room communications (radio or satellite phone)
- Instrumentation shown on QDPS
- SFP level indicators
- FLEX equipment in Building 44 or the Fukushima Response Building
- SAFER laydown area on the West side of the plant

Future changes to the FLEX strategies may be made without prior NRC approval provided the revised FLEX strategies meet the requirements of NEI 12-06 and an engineering basis is documented that ensures that the change in FLEX strategies continues to ensure the key safety functions (core cooling, SFP cooling and containment integrity) are met.

3.16.2 Procedural Guidance

The FSGs provide guidance that can be employed for a variety of conditions. Clear criteria for entry into FSGs ensures that FLEX strategies are used only as directed for BDBEE conditions and are not used inappropriately in lieu of existing procedures. When FLEX equipment is needed to supplement EOPs or abnormal operating procedures (AOP), the EOP or AOP directs the entry into and exit from the appropriate FSG procedure. FSGs are used to supplement, not replace, the existing procedure structure that establishes command and control for the event.

The STP FSGs were developed in accordance with PWROG guidelines.

Procedural interfaces have been incorporated into station procedure EC00 to include appropriate reference to FSGs and provide command and control for the ELAP (Reference 11). Additionally, a new AOP for loss of all AC power while on shutdown cooling (Reference 69) was prepared to provide the command and control function for the ELAP while on RHR since EC00 does not apply in this operating mode.

In accordance with site administrative procedures, Revision 1 of NEI 96-07 (Reference 70), Guidelines for 10 CFR 50.59 Implementation, and Revision 1 of NEI 97-04 (Reference 71), Design Bases Program Guidelines, are used to evaluate changes to current procedures, including the FSGs, to determine the need for prior NRC approval. However, per the guidance and examples provided in NEI 96-07, Revision 1, changes to procedures (EOPs, AOPs, or FSGs) that perform actions in response to an event that exceeds a site's design-basis should screen out under 10 CFR 50.59 and would not require prior NRC approval. Therefore, procedure steps which recognize the BDB ELAP/LUHS has occurred and which direct FLEX strategy actions to ensure core cooling, containment, or SFP cooling should not require prior NRC approval.

FSGs have been reviewed and validated to the extent necessary to ensure that implementation of the associated FLEX strategy is feasible. Specific FSG validation was accomplished via walk-throughs of the guidelines when appropriate, in accordance with 0PGP03-ZO-FLEX, "FLEX Support Guideline Program" (Reference 72). Revisions to the FSGs will be made in accordance with the FLEX Support Guideline Program.

The EOPs have been revised in accordance with established EOP change processes to clearly reference and identify appropriate entry and exit conditions for these pre-planned strategies. The EOPs retain overall command and control of the actions responding to a BDB external event.

3.16.3 Staffing

In December 2011, the NRC added paragraph A.9 to Section IV of 10 CFR 50, Appendix E requiring Licensees to perform a detailed analysis demonstrating that on-shift personnel assigned emergency plan implementation functions are not assigned responsibilities that would prevent the timely performance of their assigned function as specified in the emergency plan (Reference 73). NEI 10-05 (Reference 74) provides guidance for completing this analysis. However, NEI 10-05 did not consider a multi-unit BDBEE with an ELAP.

In response to NTTF Recommendation 9.3, the NRC requested that licensees assess their current staffing levels and determine the appropriate staff to fill all necessary positions for responding to a multi-unit event during a BDBEE when all units are affected, there is an ELAP, and access to the site is impeded (Reference 94).

Using the methodology presented in NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities" (Reference 75), STP performed assessments of the capability of STP's on-shift staff and augmented Emergency Response Organization (ERO) to respond to a BDBEE.

The assumptions for the NEI 12-01 scenario postulate that the BDB event involves a non-specific large-scale external event that results in an ELAP and LUHS that impacts both units on the site. Additionally, the NEI 12-01 guidance assumes that access to the site by offsite responders and resources is impeded as follows:

- 0 to 6 hours post event – No site access
- 6 to 24 hours post event – Limited site access. Individuals may access the site by walking, personal vehicle, or via alternate transportation capabilities (e.g., private resource providers or public sector support)
- Greater than 24 hours post event – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel

STP performed a "Phase 1" staffing study to evaluate the ability to respond to a BDBEE using pre-FLEX station procedures and resources. STP also performed a "Phase 2" staffing study to evaluate the ability to respond to a BDBEE using FLEX procedures and equipment. "Phase 1" and "Phase 2" as used in this section, are not to be confused with the phase designations used in the FLEX strategies.

The "Phase 1" staffing study revealed some areas for improvement in the Emergency Response Organization staffing that have been addressed (References 76 and 99).

The "Phase 2" staffing study that included staffing for FLEX strategies assessed whether or not the FLEX strategies could be performed in the required time with the current STP on-shift staffing. The "Phase 2" study concluded that STP's current on-shift staffing can implement actions required to support the FLEX strategies for the first six hours of the event (Reference 77). The assessment was verified following the completion of the FSGs and a supplement to the original staffing study "Phase 2" assessment was submitted to the NRC (Reference 78).

3.16.4 Training

STP's Nuclear Training Program has been revised to assure personnel proficiency in utilizing FSGs and associated BDB equipment for the mitigation of BDBEEs is adequate and maintained. These programs and controls were developed and have been implemented in accordance with the Systematic Approach to Training (SAT) Process.

Initial training has been provided and periodic training will be provided to site emergency response leaders on BDB emergency response strategies and implementing guidelines. Personnel assigned to direct the execution of the FLEX mitigation strategies for BDB external events have received the necessary training to ensure familiarity with the associated tasks, considering available job aids, instructions, and mitigation strategy time constraints.

As stated in Section 11.6 of NEI 12-06, ANSI/ANS 3.5 (Reference 79) 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.

Per Section 11.6 of NEI 12-06, 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 or operate equipment during these drills (Reference 9). STP plans to follow the industry guidance provided in NEI 13-06 for conducting FLEX drills (Reference 103).

3.16.5 Equipment List

The equipment stored and maintained at STP for use with FLEX strategies in response to a BDBEE is listed in Table 3.16.5-1, below. Table 3.16.5-1 identifies the quantity, applicable strategy, capacity/rating and various clarifying notes for the major BDB equipment components only.

Equipment Used in FLEX Strategies	Use and (Potential / Flexibility) Diverse Uses					Location	Performance Criteria
	Core	Containment	SFP	Instrumentation	Accessibility		
SG makeup pumps (2 per unit)	X					Pre-staged inside safety-related building	300 gpm @ 500 psig
RCS makeup pump (FLEX) for at power modes (1 per unit)	X					Pre-staged inside safety-related building	70 gpm @ 700 psig
RCS makeup pump (CVCS PDP) for at power modes (1 per unit)	X					Existing plant equipment inside safety-related building	35 gpm @ 3000 psig
RCS makeup pump (FLEX) for Modes 5 and 6 (2 per unit)	X					Pre-staged inside safety-related building	170 gpm @ 100 psi
SFP makeup pump (RMW pump) 2 per unit			X			Existing plant equipment inside safety-related building	300 gpm @ 150 psig
SFP makeup pump (FLEX) 1 per unit			X			Pre-staged inside safety-related building	250 gpm @ 150 psig

Table 3.16.5-1 – List of Equipment used in FLEX Strategies (page 1 of 2)

Equipment Used in FLEX Strategies	Use and (Potential / Flexibility) Diverse Uses					Location	Performance Criteria
	Core	Containment	SFP	Instrumentation	Accessibility		
TMDD pumps (3 total, 2 designated for FLEX and 1 for 10 CFR 50.54(hh)(2))	X	X	X			Stored in FLEX buildings outside the PA	>1000 gpm @ 175 psig
480 VAC generators (2 per unit) and associated cables, connectors and switchgear (to power FLEX equipment like pumps, battery chargers, fans, etc.)	X	X	X	X	X	Stored in missile protected enclosure on roof of safety-related structure	1000 kW each
Four-wheel drive tractor with front end loader and hose trailer (total of 2)	X	X	X		X	Stored in FLEX buildings outside the PA	
Fuel oil pumps (2 per unit)	X	X	X	X		Stored in FLEX lockers inside safety-related building	10 gpm @ 44 ft
Satellite phones (2 hard wired & 2 hand held per unit)					X	Pre-staged /stored inside safety-related building	
Fluke 705, 712B & 114				X		Stored in FLEX lockers inside safety-related building	
Radios & batteries for Security channel (10 per unit)					X	Stored in FLEX lockers inside safety-related building	

Table 3.16.5-1 – List of Equipment used in FLEX Strategies (page 2 of 2)

3.16.6 <u>N+1 Equipment Requirement</u>

NEI 12-06 requires sites to have N+1 sets of major BDB equipment that directly performs a FLEX mitigation strategy for core cooling, containment, or SFP cooling in order to assure reliability and availability of the FLEX equipment required to meet the FLEX strategies. Unit 1 and Unit 2 at STP are separated by over 600 feet and a significant external event is a large flood event, STP elected to provide N+1 equipment sets for each unit. Sufficient equipment has been purchased to address all functions at all units on-site, plus one additional spare per unit.

The N+1 capability applies to the portable FLEX equipment that directly supports maintenance of the key safety functions identified in Table 3-2 of NEI 12-06 for FLEX baseline capability for PWRs. Other FLEX support equipment provided for mitigation of BDB external events but not directly supporting a credited FLEX strategy, is not required to have N+1 capability.

In the case of hoses and cables associated with FLEX equipment required for FLEX strategies, an alternate approach to meet the N+1 capability has been selected. These hoses and cables are passive components being stored in a protected facility. It is postulated the most probable cause for degradation/damage of these components would occur during deployment of the equipment. Therefore the +1 capability is accomplished by having sufficient hoses and cables to satisfy the N capability + 10% spares or at least 1 length of hose and cable. This 10% margin capability ensures that failure of any one of these passive components would not prevent the successful deployment of a FLEX strategy. The hoses and cables that come under this requirement at STP are the following:

- SG Makeup hoses/spools – because STP has two completely different sets of pumps and hoses, this satisfies the +1 requirement.
- RCS Makeup hoses – because STP has two completely different means to fill the RCS, the hoses do not require duplication.
- SFP Makeup hoses - because STP has two completely different means to fill the RCS, the hoses do not require duplication.
- Fuel oil fill strategy – this strategy requires +1 on the pump and +1 on the hoses as discussed above. The 100 ft power cord can be replaced by ones in the MAB Hot Tool Rooms.

All FLEX support equipment and tools are subject to inventory checks, unavailability requirements, and any maintenance and testing that are needed to ensure they can perform their required functions (References 82 and 92).

3.16.7 Equipment Maintenance and Testing

Initial component level testing that consisted of Factory Acceptance Testing and Site Acceptance Testing was conducted to ensure the FLEX equipment can perform its required FLEX strategy functions. Factory Acceptance Testing verified that the pre-staged pumps performance conformed to the manufacturers rating for the equipment as specified in the Purchase Order. Verification of the vendor test documentation was performed as part of the receipt inspection process for each of the affected pieces of equipment and included in the applicable Vendor Test Reports (References 91, 100, 101). Site Acceptance Testing of the FLEX DGs and associated circuitry for all loads confirmed the FLEX equipment will perform in accordance with the FLEX strategy functional design requirements. The Site Acceptance Testing is documented in applicable work orders.

The BDB equipment that directly performs a FLEX mitigation strategy for the core cooling, containment, or SFP cooling is subject to periodic maintenance and testing in accordance with NEI 12-06 and INPO AP 913, "Equipment Reliability Process", (Reference 80), to verify proper function. Additional FLEX support equipment that requires maintenance and testing has Preventative Maintenance (PM) activities to ensure it will perform its required functions following a BDB external event. The PMs for FLEX equipment were developed using the templates and guidance contained in the EPRI report for the PM basis for FLEX equipment (Reference 81).

The PM procedures and test procedures are based on the templates contained within the EPRI Preventive Maintenance Basis Database or from manufacturer provided information/recommendations when templates were not available from EPRI. The corresponding maintenance strategies were developed and documented. The performance of the PMs and test procedures are controlled through the site work order process. FLEX support equipment not falling under the scope of INPO AP 913 will be maintained as necessary to ensure continued reliability. Performance verification testing of FLEX equipment is scheduled and performed as part of STP's PM process. Equipment maintenance and testing will be adjusted and modified based on internal operating experience (OE) and equipment performance per the STP PM process.

A procedure was established to ensure the unavailability of equipment and applicable connections that directly perform a FLEX mitigation strategy for core cooling, containment, and SFP cooling will be managed such that risk to mitigation strategy capability is minimized (Reference 82). Maintenance/risk guidance conforms to the guidance of NEI 12-06 as follows:

- FLEX equipment may be unavailable for 90 days(1) provided that the site FLEX capability (N) is available. The more restrictive exception to this is the 30 day unavailability time of the RCS makeup pumps at STP as previously discussed.
- If FLEX equipment becomes unavailable such that the site FLEX capability (N) is not maintained, initiate actions within 24 hours to restore the site FLEX capability (N) and implement compensatory measures (e.g., use of alternate suitable equipment or supplemental personnel) within 72 hours.

(1) Note that the 90 day allowed out-of-service time was reduced to 30 days for both the PDP and FLEX RCS makeup pump, as described in Section 3.5 of this FIP.

4. References

1. Enclosure to SECY-11-0093, "Recommendations for Enhancing Reactor Safety in the 21st Century – The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident", July 12, 2011 (ML111861807)

2. NRC Order Number EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events", March 12, 2012 (ML12054A735)

3. Letter from D.L. Koehl, STPNOC, to NRC Document Control Desk, "STPNOC Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", February 28, 2013 (NOC-AE-13002963)(ML13070A011)

4. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC First Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", August 26, 2013 (NOC-AE-13003027)(ML13249A060)

5. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC Second Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)", February 27, 2014 (NOC-AE-14003089)(ML14073A458)

6. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC 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) (TAC Nos. MF0825 and MF0826)", August 27, 2014 (NOC-AE-14003162)(ML14251A029)

7. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC 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) (TAC Nos. MF0825 and MF0826)", February 26, 2015 (NOC-AE-15003224)(ML15075A019)

8. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC Fifth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for

Beyond-Design-Basis External Events (Order Number EA-12-049) (TAC Nos. MF0825 and MF0826)", August 26, 2015 (NOC-AE-15003287)(ML15251A208)

9. Nuclear Energy Institute Guidance Document, NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide", Revision 0, August 21, 2012 (ML12242A378)

10. NRC Final Interim Staff Guidance, JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events", Revision 0, August 29, 2012 (ML12229A174)

11. STP Procedure, 0POP05-EO-EC00, "Loss of All AC Power", Revision 25, November 10, 2015 (STI 34238759)

12. STP Calculation,15-FR-015, "Decay Heat Curve Comparison", Revision 0, July 9, 2015 (STI 34151445)

13. South Texas Project Technical Specifications

14. STP Calculation, STP-CP-006, "ELAP Analysis with the South Texas Project RETRAN-02 Input Model", Revision 1, April 15, 2015 (STI 34064235)

15. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG10, "RCS Accumulator Injection Isolation", Revision 1, November 10, 2015 (STI 34237570)

16. STP EOP Setpoint Document, 5Z010Z51003, Revision 7, February 3, 2015 (STI 34048625)

17. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG03, "Alternate Low Pressure Feedwater", Revision 1, November 10, 2015 (STI 34236715)

18. STP Calculation, 15-FR-014, "Time to Loss of Heat Sink During an ELAP Event", Revision 0, November 9, 2015 (STI 34151443)

19. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG21, "NSRC Turbine Generator", Revision 1, November 10, 2015 (STI 34236709)

20. STP Emergency Response Desktop Guide Instruction, ZV-0028, "SAFER Response Plan", April 1, 2015 (STI 34040267)

21. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG07, "Loss of Vital Instruments or Control Power", Revision 1, November 10, 2015 (STI 34237576)

22. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG05, "Initial Assessment and FLEX Equipment Staging", Revision 1, November 10, 2015 (STI 34236725)

23. STP Design Change Package, DCP 12-11658-24, "FLEX SG Make-Up Including Filling of the AFWST from the Deaerator (DA) Blowdown Line", Revision 0, October 2, 2015 (STI 33953633)

24. STP Design Change Package, DCP 12-11658-75, "FLEX SG Make-Up Including Filling of the AFWST from the Deaerator (DA) Blowdown Line", Revision 0, March 18, 2015 (STI 34079576)

25. STP Design Change Package, DCP 12-11658-23, "FLEX RCS Make-Up/Boration", Revision 5, April 25, 2015 (STI 34115885)

26. STP Design Change Package, DCP 12-11658-74, "FLEX RCS Make-up/Boration", Revision 3, October 29, 2015 (STI 34232699)

27. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG06, "Alternate AFWST Makeup", Revision 1, November 10, 2015 (STI 34237577)

28. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG17, "Portable Pump Fill of RWST", Revision 1, November 10, 2015 (STI 34237394)

29. STP Procedure, 0POP02-CV-0003, "Mixing of Boric Acid", Revision 13, February 7, 2015 (STI 34051467)

30. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG04, "ELAP DC Bus Load Shed/Management", Revision 1, November 10, 2015 (STI 34237578)

31. STP Calculation, 2011-11676-EAD, "2011 Class 1E Battery Coping Study", Revision 1, February 3, 2012 (STI 33338842)

32. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG19, "480V FLEX Diesel Generator Operation", Revision 1, November 10, 2015 (STI 34237393)

33. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG08, "Alternate RCS Boration", Revision 1, November 10, 2015 (STI 34237574)

34. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG20, "Alternate QDPS Parameter Monitoring", Revision 1, November 10, 2015 (STI 34237391)

35. Westinghouse Report (Proprietary), PWROG 14015-P, "No-1 Seal Flow Rate for Westinghouse Reactor Coolant Pumps Following Loss of All AC Power", Revision 2, April 1, 2015 (STI 34259706)

36. STP White Paper by P. Jensen and C.R. Albury, "White Paper Demonstrating the Applicability of the RETRAN-3D Code for Analysis of the ELAP", August 21, 2014 (STI 34048769)

37. Westinghouse Report (Proprietary), PWROG 14074-P, "Benchmarking the ITCHSEAL Code," April 2015

38. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG-01, "Long Term RCS Inventory Control", Revision 1, November 10, 2015 (STI 34236714)

39. Letter from J.R. Davis, NRC, to J. Stringfellow, PWROG, "Boron Mixing Endorsement Letter in Regards to Mitigation Strategies Order EA-12-049", January 8, 2014 (ML13276A183)

40. Letter from J.R. Davis, NRC, to J. E. Pollock, NEI, "Battery Life White Paper Endorsement", September 16, 2013 (ML13241A188)

41. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG11, "Alternate SFP Makeup and Cooling", Revision 1, November 10, 2015 (STI 34237569)

42. STP Calculation, NC-7106, "Spent Fuel Pool Heatup Analysis for 18-Month Refueling Cycles", Revision 3, March 15, 2001 (STI 31238242)

43. STP Procedure, 0POP10-FP-0001, "Alternate Fire Protection System Operation", Revision 4, May 23, 2012 (STI 33551601)

44. South Texas Project Updated Final Safety Analysis Report

45. NRC Order Number EA-12-051, "Issuance of Order to Modify Licenses with Regard to Requirements for Reliable Spent Fuel Pool Instrumentation", March 12, 2012 (AE-NOC-12002271)(ML12054A679)

46. STP Calculation, 15-FR-017, Revision 0 "Spent Fuel Pool Heatup Analysis for ELAP Event" (STI 34152997)

47. STP Calculation, NAI-1646-001, "STP Electrical Auxiliary Building GOTHIC Room Heatup Analysis", Revision 1, February 10, 2015 (STI 34056329)

48. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG12, "Alternate Containment Cooling", Revision 1, November 10, 2015 (STI 34237565)

49. Letter from T. Brown, NRC, to D.L. Koehl, STPNOC, "South Texas Project, Units 1 and 2 – Report for the Onsite Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0825, MF0826, MF0827 and MF0828)", May 6, 2015 (AE-NOC-15002661)(ML15111A465)

50. EPRI Report 1025287, J. Richards, J. Hamel and R. Kassawara, "Seismic Evaluation Guidance – Screening, Prioritization and Implementation Details

(SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic", November 2012 (ML12333A170)

51. Climatic Atlas of the United States 'The Climatic Atlas of the United States," NCDC, Version 2.0 (CD-ROM), NCDC, Climate Services Division, NOAA, September 2002

52. National Oceanic and Atmospheric Administration National Climatic Data Center, Texas Storm Events, "Storm Events for Texas, Hail Event, and Snow and Ice Event Summaries," https://www.ncdc.noaa.gov/stormevents/

53. STP Calculation, SC-05018, "Design of FLEX Diesel Generator Missile Enclosure", Revision 0, July 16, 2014 (STI 33835553)

54. STP Design Change Package, DCP 12-11658-28, "FLEX Modification for two Diesel Generators, and Load Distribution Panel with Enclosure and Supporting Facilities", Revision 0, December 9, 2014 (STI 33995455)

55. STP Design Change Package, DCP 12-11658-27, "FLEX Modification for two Diesel Generators, and Load Distribution Panel with Enclosure and Supporting Facilities", Revision 0, July 16, 2014 (STI 33901830)

56. STP Condition Reporting Database Action, 12-11658-652 Attachment, "Audit item # 6-A, Warehouse 44"

57. STP Condition Report Engineering Evaluation, CREE 12-11658-741, December 3, 2015

58. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near Term Task Force Review of Insights from the Fukushima Dai-ichi Accident", March 31, 2014 (NOC-AE-14003114)(ML14099A235)

59. STP Vendor Report, "South Texas Project Units 1 and 2 Flood Analysis, Atkins", March 29, 2012 (STI 33430176)

60. STP Calculation, MC-06506, "AFW Pump Room D Maximum Temperature During a Station Blackout", Revision 0, August 17, 2004 (STI 31767960)

61. STP Procedure, 0POP10-HE-0001, "Loss of EAB HVAC", Revision 2, April 29, 2015 (STI 34117278)

62. STP FLEX Support Guideline Procedure, 0POP12-ZO-FSG01, "Long Term RCS Inventory Control", Revision 1, November 10, 2015 (STI 34236714)

63. STP Design Change Package, DCP 12-11685-34, “FLEX Power to Lighting, Receptacles and Communications”, Revision 0, December 30, 2014 (STI 34026165)

64. Letter from D.W. Rencurrel, STPNOC, to NRC Document Control Desk, “Supplement to Revised 60-Day Response to Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident”, October 31, 2012 (NOC-AE-12002918)(ML12318A096)

65. NEI Position Paper, “Shutdown/Refueling Modes”, September 18, 2013 (ML13273A514)

66. Letter from J.R. Davis, NRC, to J.E. Pollock, NEI, “Endorsement letter: Mitigation Strategies Order EA-12-049, NEI Position Paper Shutdown/Refueling Modes”, September 30, 2013 (ML13267A382)

67. STP Calculation, 15-FR-007, "RCS Boil-Off and RWST Refill Time for ELAP Event in Modes 5 & 6", Revision 0, April 23, 2015 (STI 34106175)

68. STP FLEX Program Document, FLEX-0001, 9Q539LFR0001, “Diverse and Flexible Coping Strategies (FLEX) Program Document, South Texas Project (STP) Units 1 & 2”, Revision 0, April 14, 2014 (STI 33759523)

69. STP Abnormal Operating Procedure, 0POP04-AE-0007, “Loss of All AC Power While on Shutdown Cooling”, Revision 0, April 30, 2015 (STI 34097372)

70. Letter from A.R. Pietrangelo, NEI, to D.B. Matthews, NRC, “Letter forwarding NEI 96-07 Revision 1, ‘Guidelines for 10 CFR 50.59 Implementation’”, November 17, 2000 (ML003771157)

71. Nuclear Energy Institute Guidance Document, NEI 97-04, Appendix B, “Design Basis Program Guidelines”, November 27, 2000 (ML003771698)

72. STP Procedure, 0PGP03-ZO-FLEX, “FLEX Support Guideline Program”, Revision 1, August 27, 2015 (STI 34175437)

73. STPEGS Emergency Plan

74. Nuclear Energy Institute Guidance Document, NEI 10-05, “Assessment of On-Shift Emergency Response Organization Staffing and Capabilities”, Revision 0, September 30, 2010 (ML102730613)

75. Nuclear Energy Institute Guidance Document, NEI 12-01, “Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities”, Revision 0, May 4, 2012 (ML12125A412)

76. Letter from D.W. Rencurrel, STPNOC, to NRC Document Control Desk, "Response to Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident – Phase 1 Staffing Assessment", April 25, 2013 (NOC-AE-13002989)(ML13123A028)

77. Letter from A. Capristo, STPNOC, to NRC Document Control Desk, "Response to Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident – Phase 2 Staffing Assessment", November 25, 2014 (NOC-AE-14003189)

78. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Supplement to Response to Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident – Phase 2 Staffing Assessment", July 2, 2015 (NOC-AE-15003255)

79. American Nuclear Society Standard, ANSI/ANS-3.5-2009, "Nuclear Power Plant Simulators for Use in Operator Training and Examination", September 4, 2009

80. Institute of Nuclear Power Operations, INPO AP-913, "Equipment Reliability Process Description", Revision 4, October 2013

81. Electric Power Research Institute Report, "Preventive Maintenance Basis for FLEX Equipment – Project Overview Report", September 30, 2013

82. STP FLEX Support Guideline Procedure, 0PGP03-ZO-0056, "FLEX Equipment Functionality Program", Revision 1, November 10, 2015 (STI 34237450)

83. J.R. Davis, NRC, to J. Stringfellow, NEI, "Letter to PWROG - NOTRUMP Endorsement for ELAP Events", June 16, 2015 (ML15061A442)

84. STP Procedure, 0PEP01-ZE-0003, "Core Reload Design Process", Revision 17, October 28, 2015 (STI 34230503)

85. Plant Curve Book, Figures 3.9a, "1% Subcritical Boron Concentration for ELAP Conditions with ARI and HFP Equilibrium Xenon" (STIs 34253220, 34108855)

86. Plant Curve Book, Figures 3.9b, "1% Subcritical Boron Concentration for ELAP Conditions with ARI and No Xenon" (STIs 34253221, 34108877)

87. STP Procedure, 0POP10-FC-0001, "Spent Fuel Pool Damage Mitigation Strategies", Revision 6, July 17, 2012 (STI 33573138)

88. Vendor Technical Document, Seacoast Development Group, Inc., VTD-S967-0001, "Battle Lantern, Portable, Rechargeable", Revision 1, February 4, 2010 (STI 32608918)

89. Bechtel Design Report for STP, "Reactor Containment Building Design Report, Appendix C, Calculation CC-5210", Revision 6, April 6, 1987 (STI 186)

90. STP Procedure, 0PGP04-ZE-0309, "Design Change Package", Revision 35, December 21, 2015 (STI 34254803)

91. STP Vendor Report, "Pump/Motor Performance Test Report". December 2, 2014 (STI 34037406)

92. STP Procedure, 0POP01-ZA-0001, "Plant Operations Department Administrative Guidelines", Revision 48, November 10, 2015 (STI 34237449)

93. STP Calculation, NC-07091, "EAB Gothic Modeling Input Parameters", Revision 0, January 8, 2013 (STI 32886314)

94. Letter from E.J. Leeds, NRC, to All Power Reactor Licensees, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident", March 12, 2012 (ML12053A340)

95. Vendor Technical Document, VTD-A977-0003, "SAFER Response Plan for South Texas Project Electric Generating Station", Revision 0, April 15, 2015 (STI 34077493)

96. Westinghouse Report (Proprietary), WCAP-17601-P, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs", Supplement 1, (WCAP-17601-P)(STI 33805251)

97. Letter from N. Pappas, NEI, to J.R. Davis, NRC, "EA-12-049 Mitigating Strategies Resolution of Extended Battery Duty Cycles Generic Concern", August 27, 2013 (ML13241A186)

98. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "STPNOC Response to January 23, 2013, Request for Additional Information Related to the Near-Term Task Force Recommendation 9.3 on Communications", February 21, 2013 (NOC-AE-13002958)(ML13092A258)

99. Letter from D.W. Rencurrel, STPNOC, to NRC Document Control Desk, "Revised Phase 1 Staffing Assessment Submitted in Response to Request for Information

Pursuant to 10 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights", June 3, 2013 (NOC-AE-13003004) (ML13182A021)

100. STP Vendor Report, "Pump/Motor Performance Test Report", March 31, 2015 (STI 34130445)

101. STP Vendor Report, "Pump/Motor Performance Test Report", May 28, 2015 (STI 34145846)

102. Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Bases", Revision 2, March 19, 2007 (ML07031003)

103. Nuclear Energy Institute Guidance Document, NEI 13-06. "Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents", Revision 0, September 30, 2014 (ML14269A230)

104. STP Design Change Package, DCP 12-11658-30, "FLEX Spent Fuel Pool Makeup", Revision 0, October 1, 2014 (STI 33944800)

105. STP Design Change Package, DCP 12-11658-76, "FLEX Spent Fuel Pool Makeup", Revision 0, September 9, 2015 (STI 34193889)

106. Vendor Technical Drawing, 4122--01126HX, "Outline Arrangement Pump Type 'N3' – Size 3 x 4 x 8" (STI 625080)