Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-14-233

March 12, 2015

10 CFR 2.202
10 CFR 50.4

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

Watts Bar Nuclear Plant, Unit 1
Facility Operating License No. NPF-90
NRC Docket No. 50-390

Watts Bar Nuclear Plant, Unit 2
Construction Permit No. CPPR-92
NRC Docket No. 50-391

Subject: **Compliance Letter and Final Integrated Plan in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) for Watts Bar Nuclear Plant (TAC Nos. MF0950 and MF1177)**

References:

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

2. Letter from NRC to TVA, "Watts Bar Nuclear Plant, Units 1 and 2 - Report for the Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0950, MF1177, MF0951 and MF1178)," dated May 15, 2014 (ML14128A1293.
3. Letter from TVA to NRC, "Compliance Status Letter and Final Integrated Plan in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) for Watts Bar Nuclear Plant (TAC Nos. MF0950 and MF1177)," dated October 29, 2014 (ML14303A546)

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Order EA-12-049 that directed Tennessee Valley Authority (TVA) to implement mitigation strategies for beyond-design-basis external events (Reference 1). Specific requirements were outlined in Attachment 2 of Reference 1.

The purpose of this letter is to report full compliance with the order to the NRC as required by Section IV, Condition C.3 of Reference 1, for Watts Bar Nuclear Plant (WBN), Units 1 and 2. Enclosure 1 to this letter provides a summary of compliance to each of the requirements described in Attachment 2 of Reference 1. The modifications required to support the FLEX strategies for WBN Units 1 and 2 are either closed, or the equipment has been turned over to Operations with the FLEX Design Change Notices (DCNs) and Engineering Design Change Requests (EDCRs) in the closeout process in accordance with the station design control process. Common and WBN Unit 2 FLEX procedures have been prepared, reviewed, and validated, but cannot be issued until final verification after the systems under construction, including interfacing systems, have been turned over to Operations under the site procedure control process. WBN Unit 1 and 2 training required for implementation of the FLEX strategies is complete. Some documentation actions associated with the TVA design closeout process remain open pending WBN Unit 2 system turnover.

Enclosure 2 provides a summary of the answers to the Interim Staff Evaluation open and confirmatory items provided in the FLEX/Spent Fuel Pool Instrumentation Audit Report (Reference 2) and significant issues that arose after the Audit Report was issued.

Enclosure 3 of this letter provides Revision 1 to the Final Integrated Plan (FIP) text. Revision 0 of the FIP was submitted to the NRC in Reference 3. A revision to the FIP text was necessary to address changes resulting from resolution of open items related to the addition of the mobile boration unit from the National SAFER Response Center and a change in the cooldown strategy to hold at a steam generator pressure of 300 psig. The FIP figures and drawings were provided in Enclosure 2, Attachment 3 of Reference 3, and are not being resubmitted since they have not been revised.

There are no new regulatory commitments in this letter. If you have any questions regarding this report, please contact Gordon Arent at (423) 365-2004.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 12th day of March 2015.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosures
cc: See Page 3

Enclosures:

1. Tennessee Valley Authority Watts Bar Nuclear Plant Units 1 and 2, Mitigation Strategies (FLEX) Compliance in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order EA-12-049)
2. Tennessee Valley Authority Watts Bar Nuclear Plant Units 1 and 2, Mitigation Strategies (FLEX) Technical Basis for Open Items Response Table
3. Tennessee Valley Authority Watts Bar Nuclear Plant Units 1 and 2, FLEX Final Integrated Plan, Revision 1 (Text Only)

cc (Enclosures):

NRR Director - NRC Headquarters
NRO Director - NRC Headquarters
NRR JLD Director - NRC Headquarters
NRC Regional Administrator - Region II
NRR Project Manager - Watts Bar Nuclear Plant
NRC Senior Resident Inspector - Watts Bar Nuclear Plant Unit 1
NRC Senior Resident Inspector - Watts Bar Nuclear Plant Unit 2
NRR JLD Project Manager - Watts Bar Nuclear Plant

ENCLOSURE 1

Tennessee Valley Authority Watts Bar Nuclear Plant Units 1 and 2, Mitigation Strategies (FLEX) Compliance in Response to the March 12, 2012 Commission Order Modifying Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order EA-12-049)

Introduction

Watts Bar Nuclear Plant (WBN) developed an Overall Integrated Plan (OIP) (Reference 1) for documenting the diverse and flexible strategies (FLEX), in response to Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” (Reference 2). A Final Integrated Plan was submitted in TVA’s Compliance Status Letter (Reference 3) on October 29, 2014.

The information provided herein documents the compliance of WBN Units 1 and 2, pursuant to Section IV, Condition C.3 of Reference 1, as of February 25, 2015. Compliance with specific elements of Order EA-12-049 is documented in Attachment 1 of this Enclosure. The Milestone Schedule - Items Complete is provided in Attachment 2 of this Enclosure.

TVA’s responses to the Interim Staff Evaluation (ISE) Open and Confirmatory Items (Reference 4), Licensee Identified Open Items and Audit Questions/Audit Report Open Items is summarized in Attachment 1. Detailed responses are provided in Enclosure 2 of this submittal.

Enclosure 1

Attachment 1

Order EA-12-049 Compliance Elements Summary

The elements identified below for Watts Bar Nuclear Plant (WBN) Units 1 and 2, are documented in the Overall Integrated Plan (Reference 1), the 6-Month Status Reports (References 5, 6, and 7), the response to NRC Staff Audit Question providing an alternate justification (Reference 8), and the Final Integrated Plan (Reference 3). The NRC issued the WBN Units 1 and 2, Order EA-12-049 Audit Report on May 15, 2014 (Reference 4).

Strategies - Complete

WBN Units 1 and 2 strategies are in compliance with Order EA-12-049. TVA is providing responses to strategy related Open Items, Confirmatory Items, and Audit Questions/Audit Report Open Items as documented in Enclosure 2. The closure of responses to some issues are pending NRC review.

Modifications - Complete

The modifications described in the Final Integrated Plan (FIP) required to support the FLEX strategies for WBN, Units 1 and 2, are either closed, or the equipment has been turned over to Operations with the FLEX Design Change Notices (DCNs) and Engineering Design Change Requests (EDCRs) in the closeout process in accordance with the station design control process.

Equipment – Procured and Maintenance & Testing - Complete

The equipment required to implement the FLEX strategies for WBN Units 1 and 2 has been procured in accordance with NEI 12-06, Sections 11.1 and 11.2. Required FLEX equipment has been received at WBN.

Equipment has been initially tested/performance verified as identified in NEI 12-06, Section 11.5, and is available for use.

Maintenance and testing will be conducted through the use of the WBN Preventative Maintenance (PM) Program such that equipment reliability is achieved. FLEX PM instructions have been approved and will be issued in accordance with the site PM control process. Site PMs will be scheduled for implementation in the appropriate work weeks based on their frequency as scheduled in the WBN PM Program.

Protected Storage - Complete

The WBN protected storage facility, the FLEX Equipment Storage Building (FESB), that supports implementation of the FLEX strategies for WBN Units 1 and 2 is complete. The FESB provides protection from applicable site hazards as required.

Procedures - In work

FLEX Support Instructions (FSIs) for WBN Units 1 and 2 are common procedures and have been developed and integrated with existing procedures. The FSIs and affected existing procedures have been validated but cannot be issued until final verification under the site procedure control process as DCNs and turn-over of Unit 2 systems are completed. The FSIs and affected existing procedures will be effective in accordance with the site procedure control program prior to fuel load of Unit 2.

Training - Complete

Training for WBN Units 1 and 2 has been completed in accordance with an accepted training process as recommended in NEI 12-06, Section 11.6.

Staffing - Complete

The staffing study for WBN has been completed in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(f), as provided in "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012 (Reference 9), as documented in TVA's letter to the NRC dated October 6, 2014 (Reference10).

National SAFER Response Centers - Complete

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

Validation - In work

WBN has completed validation in accordance with industry guidance, to assure required tasks, manual actions and decisions for FLEX strategies are feasible and may be executed within the constraints identified in the FIP for Order EA-12-049 for equipment that has been turned over to Operations. Final procedure verification is expected to be completed and procedures issued as transfer of WBN Unit 2 systems from construction to operations is completed in accordance with the site procedure control program.

FLEX Program Document - Complete

The TVA WBN FLEX Program Document has been developed in accordance with the requirements of NEI 12-06. Both the Corporate (NPG-SPP-09.22.2) and WBN (0-TI-447) documents have been issued.

Summary of Enclosure 2 - Open and Confirmatory Items - Complete

- ISE Open Items – TVA has finalized responses to the ISE Open Items.
- ISE Confirmatory Items – TVA has finalized responses to the ISE Confirmatory Items.
- Licensee Identified Open Items – Complete pending NRC review and closure.
- Audit Questions/Audit Report Open Items – Complete pending NRC review and closure.
- Safety Evaluation Review Items – Complete pending NRC review and closure.

References

The following references support Attachment 1:

1. Letter from TVA to NRC, “Tennessee Valley Authority (TVA) - Overall Integrated Plan in Response to the March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) for Watts Bar Nuclear Plant,” dated February 28, 2013 (ML13067A030).

2. Letter from NRC to TVA, “Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order EA-12-049),” dated March 12, 2012 (ML12054A735).

3. Letter from TVA to NRC, “Compliance Status Letter and Final Integrated Plan in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) for Watts Bar Nuclear Plant (TAC Nos. MF0950 and MF1177),” dated October 29, 2014 (ML14303A546).

4. Letter from NRC to TVA, “Watts Bar Nuclear Plant, Units 1 and 2 - Report for the Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0950, MF1177, MF0951 and MF1178),” dated May 15, 2014 (ML14128A129).

5. Letter from TVA to NRC, “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) for Watts Bar Nuclear Plant,” dated August 28, 2013 (ML13247A288).

6. Letter from TVA to NRC, “Revised Overall Integrated Plan in Response to the March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) for Watts Bar Nuclear Plant (TAC Nos. MF0950 and MF1177),” dated February 7, 2014 (ML14062A050).

7. Letter from TVA to NRC, “Third Six-Month Status Report in Response to the March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) for Watts Bar Nuclear Plant (TAC Nos. MF0950 and MF1177),” dated August 28, 2014 (ML14248A517).

8. Letter from TVA to NRC, “Response to NRC Staff Audit Question Clarification for Watts Bar Nuclear Plant, Units 1 and 2 Mitigation Strategies Integrated Plan, Phase 2 Electrical Strategy (TAC Nos. MF0950 and MF1177),” dated March 28, 2014.

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

10. Letter from TVA to NRC, “Tennessee Valley Authority (TVA) - Response to March 12, 2012, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, Enclosure 5, Recommendation 9.3, Emergency Preparedness - Staffing, Requested Information Items 1, 2, and 6 - Phase 2 Staffing Assessment,” dated October 6, 2014.

Attachment 2

Milestone Schedule - Items Complete

Milestone	Completion Date
Submit 60 Day Status Report	Oct 2012
Submit Overall Integrated Implementation Plan	Feb 2013
6 Month Status Updates	
Update 1	Aug 2013
Update 2	Feb 2014
Update 3	Aug 2014
FLEX Strategy Evaluation	June 2013
Walk-throughs or Demonstrations	Dec 2014
Perform Staffing Analysis	June 2014
Modifications	
Modifications Evaluation	Apr 2013
Unit 1 N-1 Walkdown	Apr 2013
Unit 1 Design Engineering	Oct 2013
Unit 1 Implementation Outage	May 2014
Unit 2 Construction Walkdown	Apr 2013
Unit 2 Design Engineering	Feb 2014
Unit 2 Implementation	Dec 2014
Storage	
Storage Design Engineering	Feb 2014
Storage Implementation	Dec 2014
On-Site FLEX Equipment	
Purchase/Procure	Dec 2014
Off-Site FLEX Equipment	
Develop Strategies with NSRC	Sep 2014
Identify Off-Site Delivery Stations (if necessary)	Sep 2014
Procedures	
PWROG issues FLEX Support Guidelines (FSG)	Jun 2013
Create WBN FLEX Support Instructions (FSI)	Dec 2014
Create Maintenance Procedures	Dec 2014
Training	
Develop Training Plan	Apr 2014
Training Complete	Dec 2014
Unit 1 FLEX Implementation	Dec 2014
Unit 2 FLEX Implementation	Dec 2014
Full Site FLEX Implementation	Note 1
Submit Completion Report	Note 1
Note 1: Unit 2 is the lead unit. Full FLEX implementation for the site will take place prior to Unit 2 Fuel Load.	

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY WATTS BAR NUCLEAR PLANT UNITS 1 AND 2, MITIGATION STRATEGIES (FLEX) TECHNICAL BASIS FOR OPEN ITEMS RESPONSE TABLE

ANSWERS TO OPEN OR PENDING ITEMS LISTED IN THE FLEX/SFPI AUDIT REPORT

Audit Item Reference	Item Description	Licensee Input Provided
Audit Question 1 Licensee Identified Open Item 2	Nuclear Energy Institute (NEI) document 12-06, Revision 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" (hereinafter referred to as NEI 12-06) ADAMS Accession No. ML12242A378, Section 5.3.2 consideration 1 addresses the need to evaluate deployment routes for potential soil liquefaction that could impede movement following a severe seismic event. In its integrated plan, Watts Bar indicated that the transportation routes from the storage area to the staging areas have not yet been evaluated for liquefaction. Provide the evaluation of transportation routes with respect to liquefaction to demonstrate conformance to NEI 12-06, Section 5.3.2, consideration 1.	The liquefaction study determined that a worse case potential liquefaction is nine inches at the Flex Equipment Storage Building (FESB) and deployment routes. Applicable Supporting Documents* - ePortal NRC Request 11: • "Subsurface Investigation and Foundation Report for the WBN U1 SGR Project" • "Liquefaction Induces Settlement of Haul Roads." (W50140715008)

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Audit Question 3	NEI 12-06, Section 5.3.3, considerations 2 through 4 provide guidance on the development of mitigating strategies with respect to procedural interface considerations for 1) seismic hazards associated with large internal flooding sources that are not seismically robust and do not require alternating current (ac) power, 2) loss of ac power and how the licensee will mitigate ground water in critical locations, and 3) potential impacts of non-seismically robust downstream dams. The licensee did not address considerations 2 through 4 in its implementation plan. Address these three areas identified in NEI 12-06, Section 5.3.3.	1. WBN has considered and evaluated large internal flooding sources from non-safety-related cooling water and determined it is seismically robust in accordance with augmented seismic criteria. 2. WBN is designed as a wet site and buildings are allowed to flood. Thus a loss of AC power to a sump pump would not challenge the WBN design basis 3. FSAR Section 2.4.11 addresses loss of downstream dams. The Triton 5000 Pumping System, consisting of two floating submersible source pumps that supply water to a Dominator would supply water to the Essential Raw Cooling Water (ERCW) system in the event of an Extended Loss of AC Power (ELAP) with the loss of the downstream dam. The Triton 5000 Pumping System will be deployed adjacent to the intake bay of the Intake Pumping Station (IPS) to provide raw water to the ERCW headers in the event of an ELAP with loss of a downstream dam. The Triton 5000 Pumping System will be stationed above plant Probable Maximum Flood (PMF) elevation, adjacent to the Fifth DG Building (DGB) and take suction from the flood waters to supply water to the ERCW headers inside the Fifth DGB. Applicable Supporting Documents* - ePortal NRC Request 11: • Calculation CDQ0010272013000268, “Seismic II/I Evaluation of the CCW Piping and Condenser in the Turbine,” Rev 4

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Audit Question 4 Licensee Identified Open Item 5	In its integrated plan, Tennessee Valley Authority (TVA) has provided information regarding its use of the offsite resources through the industry Strategic Alliance for FLEX Emergency Response (SAFER) program, but has not yet identified the local staging area and methods of transportation to be used to deliver the equipment to the site considering the seismic, flooding, high wind, and extreme cold hazards. Identify local staging areas and methods of transportation to these areas to demonstrate conformance to the guidance of NEI 12-06, Section 5.3.4, consideration 1; Section 6.2.3.4, considerations 1 and 2; Section 7.3.4, considerations 1 and 2; and Section 8.3.4.	The primary staging area is the Helipad located as shown in the SAFER PLAN Appendix 5e. Alternate staging areas are the Cleveland, TN Regional Jet Port and Rockwood, TN Airport. Transportation to the site will be by heavy lift helicopter or truck, as described in the SAFER Plan, depending on the condition and availability of transportation routes. Applicable Supporting Documents* - ePortal NRC Request 10: • "SAFER Response Plan for Watts Bar Nuclear Plant"
Audit Question 10	Description of and justification for the evaluation models (e.g., key code models such as those affecting natural circulation, primary-to-secondary heat transfer, critical flow, and boric acid transport; significant assumptions; boundary and initial conditions) used to ensure adequate core cooling, RCS inventory, and shutdown margin.	The referenced Westinghouse calculation demonstrates that the WBN strategy satisfies the reactor coolant system (RCS) inventory control and boration requirements. The diverse and flexible coping strategies (FLEX) and timings used are based on inputs from TVA. Applicable Supporting Documents* - ePortal NRC Request 15: • CN-SEE-II-13-26,"Redacted WBN U1 and U2 RCS FLEX Evaluation with Standard Reactor Coolant Pump Seals," Rev 1
Audit Question 11.a	Maximum leak-off value for each RCP seal in gallons per minute (gpm) assumed in the ELAP analysis	11.a. The maximum Reactor Coolant Pump (RCP) seal leak-off flow rate assumed in the ELAP analysis is 25 gpm. Reference CN-SEE-II-13-26-Redacted, Rev 1, which is based on PWROG-14015-P, Rev 0.
Audit Question 11.b	Pressure-dependent RCP seal leakage rate calculations	11.b. Pressure dependent RCP seal leakage rate calculations for Watts Bar are shown in PWROG-14027-P, Rev 2. Watts Bar is a Category 2 plant – 20.3 gpm @ 2250 psia, 23.6 gpm @ 1500 psia, and 7.8 gpm @ 310 psia. The 25 gpm used in the WBN ELAP analysis encompasses these values.

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Audit Question 11.c	NRC Information Notice (IN) 2005-14 impacts with the ELAP analysis	11.c. Calculation EPM-MA-041592 Rev 20 was prepared by Watts Bar to address the issue identified in the IN. The calculation shows the low pressure piping upstream and downstream of the RCP #1 seal flow orifice will maintain position and pressure boundary and therefore provide backpressure on the RCP seals as required during a Station Blackout (SBO) event. Applicable Supporting Documents* - ePortal NRC Request 7: • CN-SEE-II-13-26, "Redacted WBN U1 and U2 RCS FLEX Evaluation with Standard Reactor Coolant Pump Seals," Rev 1 • LTR-LIS-14-79, "Generic Information to Support Requests for Additional Information in USNRC Reviews of FLEX Overall Integrated Plans with Regard to Reflux Cooling and Boron Mixing for PA-ASC-1197," Rev 0 • LTR-ISEG-14-1, "Containment Pressures and Temperatures for WBN U1 and U2 During an ELAP Calculated with MAAP 4.07," Rev 0 • LTR-FSE-13-87, "Watts Bar U1 and U2 Plant-Specific Evaluation of Significant PWROG Generic NSSS Parameters Supporting FLEX Integrated Plan," Rev 0 • Table 1, ELAP Simulation Parameters • EPM-MA-041592 Rev 20

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Audit Question 11.e.	Section 5.7.1 of WCAP-17601 discusses the analyses for the RCS response with RCP safe shutdown/low leakage seals. In the analyses, the assumed RCS leakage is reduced to one gpm/seal plus one gpm of unidentified allowable Tech. Spec. leakage. Discuss the analysis used to determine the RCP seal leakage of one gpm/seal for the safe shutdown/low leakage seals, and address adequacy of the analysis including computer code/methodology and assumptions used, and supporting testing data applicable to the ELAP conditions. The NRC staff noted that the NRC previously reviewed and approved the use of the Westinghouse SHIELD shutdown seal data for the Model 93A RCP in the plant PRA model. If the Model 93A RCP is used, address the compliance of Sections 3.5 and 4.0 of the NRC safety evaluation (ADAMS Nos.: ML110880122 and ML110880131) approving the use of the shutdown seal with Model 93A RCP in the plant PRA model. If different RCP models are used, specify the RCP models for each applicable plant, and address the acceptability of using the SHIELD shutdown seal with these RCP models in the plant PRA model, since the NRC has not yet issued a safety evaluation approving the use of the SHIELD shutdown seal with other models in the plant PRA model. Westinghouse has issued a 10 CFR Part 21 report, "Notification of the Potential Existence of Defects Pursuant to 10 CFR Part 21," dated July 26, 2013 (ADAMS No. ML13211A168). Discuss how this Part 21 Report impacts the use of a seal leakage of one gpm in the ELAP analysis.	The WBN analysis is based on standard RCP seals. Applicable Supporting Documents* - ePortal NRC Request 15: • CN-SEE-II-13-26, "Redacted WBN U1 and U2 RCS FLEX Evaluation with Standard Reactor Coolant Pump Seals," Rev 1

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Audit Question 14	NEI 12-06, Section 3.2.1.7 (6) requires that strategies with time constraints be identified and a basis provided that the time can reasonably be met. Provide the rationale and/or analysis for the time constraints listed in your sequence of events for actions taken to maintain core cooling and RCS inventory.	WBN has validated the FLEX procedures per guidance outlined in NEI document FLEX (Beyond Design Basis) Validation Process. This process requires that the station perform a validation of all items that are considered time constraints in the FIP which must be performed in the first 24 hours of a FLEX event. For each time constraint, the NEI validation process requires a discussion of the basis of the time constraint and methods the station utilized to ensure the time constraint can be met by the stations staff. Applicable Supporting Documents* - ePortal NRC Request 25: • Validation Packages OIP-01, -02, -03, -07, -08, and 9-11, -12, -16
Audit Question 17	See ISE CI 3.2.1.8.B (see page E2-18)	n/a
Audit Question 25	Equipment impacts as a result of a loss of forced ventilation cooling	The ventilation strategies for areas identified are to open doors to reduce temperatures and if required portable fans and ducting for outside air will be provided to areas as evaluated in calculations MDQ00036030113000272, “WBNP ELAP Transient Temperature Analysis,” and GENSTP3-001, “Upper Boundary Temperature for Mild Environments Related to Environmental Qualification for Electrical Equipment.” Applicable Supporting Documents* - ePortal NRC Request 26: • Calculations MDQ00036030113000272, “WBNP ELAP Transient Temperature Analysis” • GENSTP3-001, “Upper Boundary Temperature for Mild Environments Related to Environmental Qualification for Electrical Equipment” • SL-012404, Rev. 0, “Watts Bar Nuclear Plant FLEX Implementation HVAC ELAP Analysis”

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Audit Question 27	Habitability conditions at locations requiring local operator actions, duration operators are in those locations, and provisions for operator protection.	Operators will be in the Auxiliary Building to perform damage assessment, manipulate breakers, start Safety Injection (SI) and Component Cooling System (CCS) Pumps, and stage HP FLEX Pumps. Durations are shown on the timeline. No provisions for operator protection are warranted due to temperatures identified in the WBN ELAP Transient Temperature Analysis. Applicable Supporting Documents* - ePortal NRC Request 26: • Calculations MDQ00036030113000272, "WBNP ELAP Transient Temperature Analysis" • GENSTP3-001, "Upper Boundary Temperature for Mild Environments Related to Environmental Qualification for Electrical Equipment." • SL-012404, Rev. 0, "Watts Bar Nuclear Plant FLEX Implementation HVAC ELAP Analysis"
Audit Question 28 Licensee Identified Open Item 16	NEI 12-06, Section 3.2.2, consideration (12) states that plant procedures/guidance should consider the effects of loss of heat tracing on equipment required to cope with an ELAP. Alternate steps, if needed, should be identified to supplement planned action. The licensee's plan regarding heat tracing only addressed protecting FLEX equipment from freezing temperatures while in storage, and does not discuss the loss of heat tracing and the need to protect existing plant equipment and instrumentation that may be used in the coping strategies. In Open Item OI 16, the licensee identifies the need to address the effects of extreme cold conditions on the RWST and/or BATs and the potential need to reenergize area heaters. Provide an evaluation of the effects of loss of heat tracing on installed plant equipment required to cope with an ELAP event (e.g., outdoor water storage tanks; the boric acid storage tanks and their piping). Include alternate steps in the discussion to supplement planned actions, or justify why alternate steps are not needed.	WBN has reviewed the need for heat tracing and determined that no heat tracing is required to implement strategies associated with order EA-12-049. Boric Acid Tank (BAT) heat tracing will be lost at initiation of the ELAP, however, room temperature for the BAT will not decrease significantly and use of boric acid from the BAT will occur at approximately 5 hours so BAT temperatures will be high enough to ensure availability. Refueling Water Storage Tank (RWST) instrumentation is outside and may freeze after loss of heat tracing, however, staff awareness of inventory in the RWST and strategies to utilize inventory in the RWST for RCS makeup do not rely on use of instrumentation because the total makeup to RCS is less than the RWST inventory. Applicable Supporting Documents* - ePortal NRC Request 14: • FSI-5.01, "Initial Assessment and FLEX Equipment Staging," Appendix A, "Freeze Protection Considerations" • LTR-SEE-II-14-44, "Westinghouse Response to FLEX Audit Question 28, Licensee Identified Open Item 16, in Support of the Overall Integrated Plan Submittal for Watts Bar Units 1 and 2," dated July 31, 2014

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Audit Question 29	See ISE CI 3.2.4.4.A and ISE CI 3.2.4.5.A (Pages E2-20 and E2-21)	n/a
Audit Question 32	See ISE CI 3.2.4.9.A (Page E2-21)	n/a
Audit Question 48	See ISE CI 3.2.4.1.A (Page E2-18)	n/a
Audit Question 53	Accumulator injection of borated water	Prior to either FLEX or SI pump injection, the accumulators are the main source of makeup inventory and additional shutdown margin. The accumulators inject once the RCS pressure reaches the minimum gas cover pressure. The accumulator injection rate is a function of RCS pressure. Applicable Supporting Documents* - ePortal NRC Request 15: • CN-SEE-II-13-26, "WBN FLEX Evaluation with Standard Seals," Rev 1
Audit Question 55	See ISE CI 3.1.2.2.A (Page E2-18)	n/a

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Licensee Identified Open Item 2	See Audit Question 1 (Page E2-2)	n/a
Licensee Identified Open Item 3	Refueling Strategy for Flex Equipment	The Maintenance Instruction (MI) provides steps to refuel diesel driven portable equipment during a FLEX event. The fuel assumption evaluation demonstrates that there is at least 7 days supply of diesel fuel onsite for the required equipment. Applicable Supporting Documents* - ePortal NRC Request 17: • TVA Procedure 0-MI-360.023 “FLEX - Portable Diesel Equipment Refueling” • W50140715007, “Fuel Consumption.” Fuel consumption spreadsheet provided to show that fuel supply of equipment will last seven days.
Licensee Identified Open Item 4	RCS Venting into Containment to Support Core Cooling: No information regarding actions to mitigate pressurization of containment due to steaming when RCS vent paths have been established or actions to mitigate temperature effects associated with equipment survivability. An evaluation will be provided to prove indefinite containment coping.	Per 0-FSI-8, the RCS will be vented only if there isn’t adequate room to put enough borated water into the RCS. Venting will be through the Reactor Head Vents. The venting would only last long enough to reach depressurization termination criteria. WBN’s LTR-ISENG-14-1, “Containment Pressures and Temperatures for Watts Bar 1 and 2 during ELAP,” calculated with Modular Accident Analysis Program (MAAP) 4.07 indicates sufficient margin to address an RCS vent requirement scenario. 0-FSI-12, Alternate Containment Cooling, addresses the mitigation of containment temperature and pressure issues. Applicable Supporting Documents* - ePortal NRC Requests 7, 9 and 19: • “NRC Audit Item 15 - WBN Mitigation Strategies” • LTR-ISENG-14-1, “Containment Pressures and Temperatures for Watts Bar 1 and 2 during ELAP” • 0-FSI-8, “Alternate RCS Boration,” steps [3] thru [7] for sufficient boration • 0-FSI-12, “Alternate Containment Cooling”

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Licensee Identified Open Item 5	See Audit Question 4 (Page E2-3)	n/a
Licensee Identified Open Item 7	A thorough analysis of the makeup flow rate requirements and other equipment characteristics will be finalized during the detailed design phase of FLEX.	Detailed FLEX operating conditions and pump sizing has been completed. Applicable Supporting Documents* - ePortal NRC Requests 15 and 18: • CN-SEE-II-13-26, Rev 1 • WBT-D-5079, "FLEX As-Built Hydraulic Calculation"
Licensee Identified Open Item 9 ISE CI 3.4.A	Off-Site Resources - Review how conformance with NEI 12-06, Section 12.2 guidelines 2 through 10 will be met	The WBN SAFER National Response Center Playbook addresses this item. See ISE CI 3.4.A Applicable Supporting Documents* - ePortal NRC Request 10 and 17: • WBN SAFER National Response Center Playbook • "Site Topo"
Licensee Identified Open Item 10	Loss of Containment Instrumentation during a Flood: Containment temperature instrumentation is only available until flood waters enter the TSC inverter or station battery rooms. Requirements for NSSS-specific FSGs for containment temperature, as noted in APPENDIX F of Reference 11, are pending further evaluation. A method to monitor containment temperature, post-flood, will be developed.	A site-specific calculation to analyze containment parameters was performed that indicated there are approximately 144 hours available after event initiation to implement mitigation actions before containment design limits would be reached. WBN will utilize "indirect reading" to infer containment temperature from pressure and reactor coolant system leakage. WBN also has the ability to read the containment temperature instrument locally. Applicable Supporting Documents* - ePortal NRC Request 14: • LTR-FSE-14-49, "Westinghouse Response to FLEX Licensee Identified Open Item 10 in Support of the Overall Integrated Plan Submittal for Watts Bar Unit 1 and Unit 2," dated June 12, 2014

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Licensee Identified Open Item 11	Final HVAC analysis	Calculation MDQ0003602012000272, “WBNP ELAP Transient Temperature Analysis,” and SL-012404, Rev. 0, “Watts Bar Nuclear Plant FLEX Implementation Heating, Ventilation, and Air Conditioning (HVAC) ELAP Analysis, provides the analysis of the transient temperature response of rooms in the Control and Auxiliary Buildings that contain equipment necessary for coping with emergency plant function during a loss of HVAC in an ELAP event. Applicable Supporting Documents* - ePortal NRC Request 26: • Calculation MDQ0003602012000272, “WBNP ELAP Transient Temperature Analysis,” Rev. 1 • SL-012404, Rev. 0, “Watts Bar Nuclear Plant FLEX Implementation HVAC ELAP Analysis”
Licensee Identified Open Item 12	Deployment of FLEX equipment to provide core cooling in Modes 5 and 6 with SGs unavailable	NPG-SPP-07.2.11, Rev 5, incorporates the FLEX equipment into the Contingency Plans to maintain Defense in Depth Margin and the Outage Safety Plan. Applicable Supporting Documents*: • NPG-SPP-07.2.11, “Shutdown Risk Management,” Rev 5
Licensee Identified Open Item 13	An evaluation of the impact of FLEX response actions on design basis flood mode preparations will be performed. This evaluation will include the potential for extended preparation time for FLEX. Changes which affect the Integrated Plan will be included in the 6 month update.	TVA’s River Systems Operation (RSO) will notify the WBN control room if Watts Bar Hydro instantaneous flow rate reaches 170,000 cfs, which approximates the 25 year flood frequency based upon observed historical flow data. This notification will provide for initiation and completion of preparatory FLEX equipment deployment and mitigation strategy implementation prior to conditions that might trigger a Stage 1 Flood Warning from RSO. Applicable Supporting Documents* - ePortal NRC Request 14: • “NRC Audit Item 18 - WBN Mitigation Strategies.” • AOI-7.01, “Probable Maximum Flood”

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Licensee Identified Open Item 15	The CETs are only available until water enters the auxiliary instrument room. A method to monitor CET, post flood, will be evaluated and developed, if required.	A method to monitor Core Exit Thermocouples (CETs), post flood, is provided in 0-FSI-7. T-hot is allowed to be substituted for the CETs when the CETs become unavailable during a DBF. AOI-7.10 has been revised to keep the Aux Control Room T-hot loops (which are above the DBF level), energized and available. Applicable Supporting Documents* - ePortal NRC Requests 9 and 23: • "NRC Audit Open Item 19" • 0-FSI-7, "Loss of Vital instrumentation or Control Power," Appendix B, "Establishment of Alternate Indications for Essential Instruments"
Licensee Identified Open Item 16	See Audit Question 28 (Page E2-8)	n/a
Licensee Identified Open Item 17	Contract with the SAFER team	Agreement with SAFER National Response Center is in place. Applicable Supporting Documents* - ePortal NRC Request 17: • "SAFER Response Plan for Watts Bar Nuclear Plant"
ISE OI 3.2.4.8.A	See ISE CI 3.2.4.8.A (Page E2-21)	n/a
ISE OI 3.2.1.6.A	Sequence of Events (SOE) - Reanalysis to support the revised timelines, both for the flood and the non-flood conditions	The FIP provides revised timelines for flood and non-flood conditions. Applicable Supporting Documents*: • Letter from TVA to NRC, "Compliance Status Letter and Final Integrated Plan in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) for Watts Bar Nuclear Plant (TAC Nos. MF0950 and MF1177)," dated October 29, 2014 (ML14303A546).

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.1.1.2.A	Deployment of FLEX Equipment - Design features of the FESB including the susceptibility to the loss of ac power	Calculation CDN0000002012000130 establishes the wind and seismic design requirements. The FESB has structural members with eye-pads to allow pulling the door open or closed with pre-staged chain falls and/or pushing the door with mechanical equipment. The door has been opened with a chain fall without any assistance with the motor declutched (i.e., disengaged). Applicable Supporting Documents* - ePortal NRC Requests 22 and 28: • SE Trk Item 3-A DCN 59084 FESB Design • Calculation CDN0000002012000130 “FLEX Equipment Storage Building - Civil Design Basis and Criteria” Rev. 1 • Paper “Confirmatory Action Item Number 3” • Dominator 1141108T Dwg • Dominator 1141217 Dwg • FLEX Diesel Driven Transfer Pump Dwg 3844 • IP FLEX Pump Dwg 3897 • Triton Pump Dwg B60-32-000 • Fukushima Milestone Schedule for FLEX Procedures and Training
ISE CI 3.1.4.1.A	Protection of FLEX DGs from Extreme Temperature Hazard - low temperature hazard	The WBN Maximum and Minimum Abnormal Ambient Temperatures are 6°F to 102°F respectively. No enclosure room heating is required to meet the Site’s Design Basis Ambient Temperature Conditions. No enclosure room ventilation is required for the 480 V DG. Applicable Supporting Documents* - ePortal NRC Request 28: • Calculation WBNAPS4004, “Summary of Mild Environment Conditions for WBN,” Rev 31 • 480V DG Protection for Extreme Cold • 480V DG Protection from Extreme Cold - Shop Order Detail Report • 6900V DG Protection from Extreme Cold - Shop Order Detail Report

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.1.5.1.A	Protection of FLEX DGs from Extreme Temperature Hazards - High temperature hazard	No enclosure room ventilation is required for the 480 V DG. Applicable Supporting Documents* - ePortal NRC Request 28: • Calculation WBNAPS4004, “Summary of Mild Environment Conditions for WBN,” Rev 31 • 480V DG Protection from Heat • 480V DG Protection from Extreme Cold - Shop Order Detail Report • 6900V DG Protection from Extreme Cold - Shop Order Detail Report
ISE CI 3.2.1.1.A	Computer Code Modeling - Confirm applicability of recommendations in WCAP-17601-P	LTR-FSE-13-87, “Plant Specific Evaluation WCAP 17601,” Rev 0, confirms the applicability of the recommendations in WCAP-17601-P. Applicable Supporting Documents* - ePortal NRC Request 7: • LTR-FSE-13-87, “Plant Specific Evaluation WCAP 17601,” Rev 0
ISE CI 3.2.1.1.B	Computer Code Modeling - Confirm that the ELAP analysis using the NOTRUMP code was limited to flow conditions before reflux condensation initiates. This includes specifying an acceptable definition for reflux condensation cooling. Open Item 2: The licensee has not provided sufficient information to justify application of the PWROG-14064-P method to scale the generic WCAP-17601-P reference plant results to Watts Bar according only to differences in reactor coolant system leakage. Whereas, the actual coping time applicable to Watts Bar would appear to be affected by differences relative to the reference plant regarding parameters such as the difference in cooldown terminus and accumulator design parameters. (SE Tracker 8-A)	The ELAP analysis using the NOTRUMP code was limited to flow conditions before reflux condensation initiates. The conclusion of the evaluation is that WBN will not enter a reflux condition prior to 5.8 hours. Open Item 2: See response to ISE CI 3.2.1.1.A (above) Applicable Supporting Documents* - ePortal NRC Request 15 and 27: • WBN SE Trker Rx Syst Open Item Response • LTR-FSE-14-97, “Westinghouse Input to Watts Bar Open Items, 2, 4, 5 and 7 Supporting Implementation of Order EA-12-049)” • LTR-TSE-13-87, “Watts Bar Unit 1 and Unit 2 Plant-Specific Evaluation of Significant PWROG Generic NSSS Parameters Supporting FLEX Integrated Plan”

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.2.1.2.B	RCP Seals - Confirm integrity of O-rings if the cold leg temperature exceeds 550 degrees F during the ELAP event. Open Item 6: The licensee has not provided confirmation that RCP o-rings used in high-temperature service applications are qualified to temperatures equivalent or superior to that of the 7228-C o-ring design. (SE Tracker 9-A)	The qualification of the 7228A compound was completed in WCAP-10541 R2 Section 5.1, "High Temperature Extrusion Qualification Testing of Seals Eastern 7228A O-ring Compound". This qualification was completed at the test conditions mentioned. The 7228-B compound was qualified in the same manner as the 7228-A compound. From PWROG-14015-P, Table 6, Category 2 plants have a maximum pressure at the pump outlet of 899 psia at a cold leg pressure of 2250 psia. This dp would be 1351 psid. Based on Watts Bar expected conditions at the seal during ELAP and the test pressure used for 7228-B O-rings, TVA considers the WBN ELAP conditions as bounded by the qualification test parameters (0.018" gap/550°F/1800 psid). Applicable Supporting Documents* - ePortal NRC Request 27: • "WBN SE Trker Rx Sys Open Item Response" • "Staff Questions on Watts Bar Open Item 6 (Rx Systems)" • PWROG-14015-P, "No. 1 Seal Flow Rate for Westinghouse Reactor Coolant Pumps Following Loss of All AC Power, Task 2: Determine Seal Flow Rates" • WCAP- 10541 R2, "Reactor Coolant Pump Seal Performance Following a Loss of All AC Power"
ISE CI 3.2.1.3.A	Decay Heat - Confirm the input values used for the decay heat model for Watts Bar Units 1 and 2	CN-SEE-II-13-19 includes the integrated condensate use over time for the ELAP event and contains bounding and conservative assumptions, specifically for Auxiliary Feedwater (AFW) inventory temperature, and adjustments made for cooldown, sensible heat removal, and refill of Steam Generator (SG) void collapse. Applicable Supporting Documents* - ePortal NRC Request 30: • CN-SEE-II-13-19, "Best Estimate Condensate Use During an Extended Loss of AC Power Due to Decay Heat at Watts Bar Units 1 and 2"

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.2.1.7.A	Cold shutdown and refueling	WBN incorporates the supplemental guidance provided in the NEI Position Paper, "Shutdown/Refueling Modes." Applicable Supporting Documents* - ePortal NRC Request 29: • NEI Position Paper, "Shutdown/Refueling Modes" • NRC Endorsement Ltr - Shutdown-Refueling Modes (ML13267A382) • PER 843997, "NEI 12-06 guidance for incorporating FLEX strategies into outage defense in depth" • Engineering email, "Plan for Revising SPP-09.3 and SPP-09.3.1"
ISE CI 3.2.1.8.A	Core Sub Criticality - The reanalysis to support the revised core boration coping strategy will be provided in a future 6-month update. The overall approach for providing boration early in the ELAP event including the deployment considerations and the rate of boration as it affects sizing the HP FLEX pump is to be verified. The licensee has not provided sufficient information to demonstrate that adequate shutdown margin is available to offset the positive reactivity addition associated with cooling down and depressurizing the reactor coolant system to a pressure of 160 psig in the steam generators.	ECA-0.0 step 18 directs the ELAP declaration, along with the implementation of FSI-8, Alternate Boration. FSI-8 determines and ensures the required boron injection to maintain the RCS subcritical at Xenon-free condition at an RCS cold leg temperature of 350°F (the RCS temperature after the second SG depressurization to 165 psig). ECA-0.0 step 29 requires a verification that the FSI-8 required boration is complete (including a 1 hour mixing time), and that the Cold Leg Accumulators (CLAs) are isolated to prevent N2 injection to the RCS. These sub-steps (a., b., c., and d.) are required to be completed prior to initiating sub-step e., the SG depressurization to 165 psig from 300 psig. Applicable Supporting Documents* - ePortal NRC Request 15 and 27: • CN-SEE-II-13-26, "Watts Bar Unit 1 and Unit 2 Reactor Coolant System FLEX Evaluation with Standard Reactor Coolant Pump Seals" • TVA Procedure NFTP-111, Rev 12, "Nuclear Design and Core Analysis" • ECA-0.0, "Loss of Shutdown Power"

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.2.1.8.B Audit Question 17	Core Sub Criticality - The generic issue of the boric acid mixing model is not yet resolved. Pending resolution of this issue the impact on the Watts Bar analysis will need to be evaluated.	CN-SEE-II-13-26, "Watts Bar Unit 1 and Unit 2 Reactor Coolant System FLEX Evaluation with Standard Reactor Coolant Pump Seals" provides resolution of the boric acid mixing model for WBN. Applicable Supporting Documents* - ePortal NRC Request 15: • CN-SEE-II-13-26, "Watts Bar Unit 1 and Unit 2 Reactor Coolant System FLEX Evaluation with Standard Reactor Coolant Pump Seals"
ISE CI 3.1.2.2.A Audit Question 55	Deployment Flood Hazard FLEX equipment - Review timing and location for staging, connecting and powering up the submersible high pressure (HP) and intermediate pressure (IP) FLEX pumps based on the revised strategy resulting from using conventional RCP seals instead of the low leakage design originally assumed in the Integrated Plan.	The 480v motor driven HP and Mode 5 & 6 IP FLEX pumps have been pre-staged on Auxiliary Building (AB) elevation 692 and the IP FLEX pumps on AB elevation 737. Resources assigned and activity durations (start to aligned) in the timeline (waterfall) are based on field walkdowns and tabletop discussions with site personnel, various design engineering contractors and Fukushima Response Team personnel. These conservative estimates have been validated. Applicable Supporting Documents* - ePortal NRC Request 9: • "Audit Item 1 - WBN Mitigating Strategies"
ISE CI 3.2.3.A	Demonstration of Maintenance of Containment Functions	LTR-ISENG-14-1, "Containment Pressures and Temperatures for Watts Bar Units 1 and 2 during an ELAP: Calculated with MAAP 4.07", demonstrates that the containment pressure and temperature 72 hours into the ELAP are sufficiently benign, and well below design limits, to allow additional time for mitigation actions. Applicable Supporting Documents* - ePortal NRC Request 7: • LTR-ISENG-14-1, "Containment Pressures and Temperatures for Watts Bar Units 1 and 2 during an ELAP: Calculated with MAAP 4.07"

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.2.4.1.A Audit Question 48	Equipment Cooling - Confirm that the spent fuel pool cooling system pumps, component cooling system pumps and the air compressors are sufficiently cooled to function for their expected duration during the ELAP event.	The SFP cooling pumps and its support equipment will survive an ELAP event. The FLEX stage 2 strategies will power the SFP pump motors from the FLEX 3 MWe DG's. Analysis SL-012404, Rev. 0 demonstrates that the equipment is sufficiently cooled to function for their expected duration during the ELAP event. Applicable Supporting Documents* - ePortal NRC Request 9: • "NRC Audit Item 5" • SL-012404, Rev. 0, "Watts Bar Nuclear Plant FLEX Implementation HVAC ELAP Analysis"
ISE CI 3.2.4.2.A	Ventilation - Analysis to determine the temperature rise in the Safety Injection pump room and component cooling system pump room	"FLEX Implementation HVAC ELAP Analysis," SL-012404, Rev 0, provides the analyses for the temperature rise in the Safety Injection pump room and component cooling system pump room. Applicable Supporting Documents* - ePortal NRC Request 16: • SL-012404, Rev. 0, "Watts Bar Nuclear Plant FLEX Implementation HVAC ELAP Analysis"

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.2.4.2.B	Effect of Temperature on Electrical Equipment Due to Loss of HVAC during ELAP	Calculation MDQ0003602013000272, "WBNP ELAP Transient Temperature Analysis," and Analysis SL-012404, Rev. 0, "FLEX Implementation HVAC ELAP Analysis," determined the transient temperature response of rooms in the Control Building and Auxiliary Building that contain equipment necessary and/or desired for coping with emergency plant functions during a loss of HVAC in an extended loss of AC power event. Ventilation strategies for areas identified are to open doors to reduce temperatures and if required portable fans and ducting for outside air will be provided. Turbine Driven Auxiliary Feedwater (TDAFW) Pump Room el. 692 temperature increases to 126.6°F at 72 hours. Doors to the room will be opened to reduce this temperature. Electrical panels on el 757 are at 110°F. Inverters on el 757 are at 110°F. Main Control Room el 755 will be less than 110°F based on LED emergency light installation. Applicable Supporting Documents* - ePortal NRC Request 29: • Calculation MDQ0003602013000272, "WBNP ELAP Transient Temperature Analysis" • Calculation GENSTP3-001, "Upper Boundary Temperature for Mild Environments Related to Environmental Qualification of Electrical Equipment," Rev 0 • SL-012404, Rev. 0, "Watts Bar Nuclear Plant FLEX Implementation HVAC ELAP Analysis"
ISE CI 3.2.4.2.C	Battery Room Temperatures	Analyses have been performed to demonstrate the vital battery rooms I-IV can tolerate a loss of ventilation for more than 72 hours. The temperature in any vital battery room is less than 115°F at 72 hours assuming no ventilation without opening doors. Applicable Supporting Documents* - ePortal NRC Request 29: • Calculation MDQ0003602013000272, "WBNP ELAP Transient Temperature Analysis" • Calculation GENSTP3-001, "Upper Boundary Temperature for Mild Environments Related to Environmental Qualification of Electrical Equipment," Rev 0

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.2.4.2.D	Battery Room Hydrogen Mitigation	EPM-RIU-112288, "125V DC Vital Battery Rooms Ventilation," Rev 0 determined the ventilation requirements of the 125V DC Vital Battery Rooms, necessary to prevent the accumulation of hydrogen gas produced by the batteries. The vital battery rooms I-IV can tolerate a loss of ventilation for approx 4.51 days. The hydrogen was limited to 2% concentration at 4.51 days. Applicable Supporting Documents* - ePortal NRC Request 29: • EPM-RIU-112288, "125V DC Vital Battery Rooms Ventilation," Rev 0
ISE CI 3.2.4.4.A Audit Question 29	Communication- Confirmation will be required that upgrades to the site's communications systems have been completed in accordance with TVAs Communications Assessment and as evaluated by the NRC staff documented in ADAMS Accession No. ML13142A348.	Upgrades to the site's communications systems have been completed in accordance with TVAs Communications Assessment and as evaluated by the NRC staff documented in ADAMS Accession No. ML13142A348. Applicable Supporting Documents* - ePortal NRC Request 17: • "NRC Audit Item 6 - ISE 3.2.4.4.A Response R1a."
ISE CI 3.2.4.5.A Audit Question 29	Accessibility to protected and internal locked areas	WBN Emergency Response plans address effects of an ELAP after BDBEE on the Security boundary systems. Applicable Supporting Documents* - ePortal NRC Request 29: • "Impact to FLEX equipment by Security boundary systems," 2-28-2014

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.2.4.8.A ISE OI 3.2.4.8.A	Alternate Approach & Sizing of FLEX DG	Flex DG sizing is based on a load analysis and manufacturer specifications. Applicable Supporting Documents* - ePortal NRC Request 30: • Calculation EDQ0009992013000147, "Technical Justification for Extended Station Blackout Diesel Generators," Rev 001 • 480v Manufacturer Spec Sheet DS00180D6SRA • Calculation EDN0003602013000350, "6900V 3MS Diesel Generator 3A and 3B Electrical Cable System Analysis," Rev 000 • 6900V FLEX DG Loading Spreadsheet • 6900V Manufacturer Spec Sheet 3250-SC6DT2
ISE CI 3.2.4.9.A Audit Question 32	Refueling Strategy for FLEX Equipment - Confirm the licensee approach on how fuel quality will be assured during long term storage for FLEX equipment.	FLEX PM's will maintain fuel oil level and long term quality in FLEX equipment. Applicable Supporting Documents* - ePortal NRC Request 17: • TVA Procedure 0-MI-360.023, "FLEX - Portable Diesel Equipment Refueling" Update – Procedures are in place to sample or replace fuel oil in FLEX equipment. Procedure 0-CM-6.03, Diesel Fuel Control, samples the installed FLEX DG day tanks (6900 MW and 480 V). Individual PM Work Instructions sample or replace the fuel oil in other diesel powered FLEX equipment (e.g., Triton Satellite Pumping Trailer).

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
ISE CI 3.2.4.10.A	Battery Duty Cycle Load Profiles & Load Shedding	ECA-0.0, “Loss of Shutdown Power” and 0-FSI-4, “DC Bus Management/Load Shed and 480V FLEX DG Alignment/Loading,” address load shedding requirements. Applicable Supporting Documents* - ePortal NRC Requests 19 (for FSIs) and 30: • Calculation EDQ00023620070003, “125V DC Vital Battery System Analysis,” Rev 26 • ECA-0.0, “Loss of Shutdown Power” • 0-FSI-5.02, “6900V FLEX DG Startup and Alignment,” Rev 0A • 0-FSI-5.03, “6.9kV & 480V Shutdown Board Initial FLEX Alignment,” Rev 0A • 0-FSI-5.04, “6900V FLEX DG Plant Equipment Loading,” Rev 0A • Paper “Review Load Shedding Scheme for the 6900V FLEX DG • 0-FSI-4, “DC Bus Management/Load Shed and 480V FLEX DG Alignment/Loading,” Rev 0A • Paper “Review Load Shedding Scheme for the 480V FLEX DG • Paper “DC Load Profile and Shedding Scheme” • DCN 60976 FLEX Vital Power Manual Load Shed Drawings, Load Shed Drawings
ISE CI 3.4.A Licensee Identified Open Item 9	See Licensee Identified Open Item 9 (Page E2-11)	n/a

*Documents either provided on the ePortal or reviewed by NRC during the audit process

ANSWERS TO SIGNIFICANT ISSUES

Audit Item Reference	Item Description	Licensee Input Provided
Safety Evaluation Review Item 1	In review of the draft FLEX Support Guidelines (FSGs) developed for the licensee by Westinghouse, the NRC staff noted that FLEX Support Instruction (FSI)-7, Appendix A, on page 33 of 200, provides a graph of AFW flow required to remove decay heat versus the time after shutdown, but no instructions or cautions are provided in the guidelines to adjust the flow for the power history at shutdown if the unit has not been operating for an extended period at full power. FSI-7, Step 3.2, item 3b requires the operator to set flow for the turbine-driven AFW pump using this graph directly and similarly does not include instructions or cautions related to the power history at shutdown. The NRC staff cross-checked the draft version of 2-ECA-0.0, which is the emergency operating procedure for loss of all alternating current power for Watts Bar Unit 2 and found the same issue in Appendices B and E.	A specific WBN response was provided under Reference LTR-FSE-14-48, "Westinghouse Response to FLEX Audit Safety Evaluation Review Item 1 in Support of the Overall Integrated Plan Submittal for Watts Bar Unit 1 and Unit 2," dated June 18, 2014. Applicable Supporting Documents* - ePortal NRC Request 9: • LTR-FSE-14-48, "Westinghouse Response to FLEX Audit Safety Evaluation Review Item 1 in Support of the Overall Integrated Plan Submittal for Watts Bar Unit 1 and Unit 2," dated June 18, 2014. Update - Procedure 2-ECA-0.0 has been revised to refer to FSI-7. FSI-7 has been revised to include the AFW flow requirement curve and a caution that states the curve is based on extended full power operation and the actual plant power history should be considered in estimating the required AFW flow.

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Safety Evaluation Review Item 2	The generic analysis in WCAP-17601-P strictly addressed ELAP coping time without consideration of the actions directed by a site's mitigating strategies. WCAP-17792-P extends these analytical results through explicit consideration of mitigating strategies involving RCS makeup and boration. In support of the RCS makeup and boration strategies proposed therein, a generic recommendation is made that PWRs vent the RCS while makeup is being provided. a. If the mitigating strategy will include venting of the RCS, please provide the following information: i. The vent path to be used and the means for its opening and closure. ii. The criteria for opening the vent path. iii. The criteria for closing the vent path. iv. Clarification as to whether the vent path could experience two-phase or single-phase liquid flow during an ELAP. If two-phase or liquid flow is a possibility, please clarify whether the vent path is designed to ensure isolation capability after relieving two-phase or liquid flow. v. If relief of two-phase or liquid flow is to be avoided, please discuss the availability of instrumentation or other means that would ensure that the vent path is isolated prior to departing from single-phase steam flow. vi. If a pressurizer PORV is to be used for RCS venting, please clarify whether the associated block valve would be available (or the timeline by which it could be repowered) in the case that the PORV were to stick open. If applicable, please further explain why opening the pressurizer PORV is justified under ELAP conditions if the associated block valve would not be available. vii. If a pressurizer PORV is to be used for RCS venting, please clarify whether FLEX RCS makeup pumps and FLEX steam generator makeup pumps will both be available prior to opening the PORV. If they will not both be available, please provide justification. b. If RCS venting will not be used, please provide the following information: i. The expected RCS temperature and pressure after the necessary quantity of borated makeup has been added to an unvented RCS. ii. Adequate justification that the potential impacts of unvented makeup will not adversely affect the proposed mitigating strategy (e.g., FLEX pump discharge pressures will not be challenged, plant will not reach water solid condition, adequate boric acid can be injected, increased RCS leakage will not adversely affect the integrated plan timeline, etc.). Open Item 9: The licensee has not provided sufficient justification for preferentially using the pressurizer power-operated relief valve to vent the reactor coolant system, if necessary under ELAP conditions, rather than the safety-related and redundant reactor vessel head vent system. (SE Tracker 2-E)	The preference for venting the RCS for boration from the pressurizer Power Operated Relief Valves (PORVs) to the head vents was revised in 0-FSI-8, "Alternate RCS Boration." A copy of 0-FSI-8 with the revision was provided. Applicable Supporting Documents* - ePortal NRC Request 27: • 0-FSI-8, "Alternate RCS Boration," Revision 0000

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided

Safety Evaluation Review Item 3	(Westinghouse Standard RCP Seals: NSAL-14-1) On February 10, 2014, Westinghouse issued Nuclear Safety Advisory Letter (NSAL)-14-1, which informed licensees of plants with standard Westinghouse RCP seals that 21 gpm may not be a conservative leakage rate for ELAP analysis. This value had been previously used in the ELAP analysis referenced by many Westinghouse PWRs, including the generic reference analysis in WCAP-17601-P. Therefore, please provide the following information:
	a. Clarify whether the assumption of 21 gpm of seal leakage per RCP (at 550 degrees F, 2250 psia) remains valid in light of the issues identified in NSAL-14-1.
	b. Identify the corresponding leakage rate from NSAL-14-1 or other associated documents (e.g., PWROG-14015-P, PWROG-14027-P) that is deemed applicable.
	c. Provide the plant-specific design parameters associated with the seal leakoff line and confirm whether they are bounded by each of the model input parameters in Table 2 of PWROG-14015-P for the appropriate analysis category. If any parameters in Table 2 are not bounded, please provide justification that the generically calculated leakage rate and maximum pressure are applicable.
	d. Confirm that the #1 seal faceplate material is silicon nitride for all RCPs. Alternately, if one or more RCPs use a different material, please identify the material used and provide justification for the leakage rate assumed to apply to these RCPs.
	e. Provide the set pressure and flow area associated with the relief valve on the #1 seal leakoff line common header piping.
	f. Provide an estimate of the piping diameter, length, and number and type of components for the seal leakoff line common header piping.
	g. If plant modifications will be undertaken to move the plant to a more favorable category relative to RCP seal leakage, please identify the applicable modifications and discuss the associated completion timeline.
	
	Open Item 3: TVA indicated that Watts Bar is relying on the generic reactor coolant pump seal leakage calculations being performed by the industry, and Watts Bar is considered to be in the second generic analysis category (i.e., Category 2). However, the licensee has not provided sufficient information to confirm that the plant-specific leakoff line hydraulic characteristics are bounded by the assumed characteristics analyzed for Category 2. (SE Tracker 3-E)
		RCP seal leak-off piping information provided to Westinghouse by TVA determined that Watts Bar is a category 2 plant. A detailed description of this piping is included in calculation EPMMA041592 (Copy provided on the ePortal). This calculation uses 2030 psig at 352°F for the transient condition during an ELAP event. Isometric drawings and flow diagrams for this piping are listed below and are provided on the ePortal.
		
		This information verifies that Watts Bar does meet the characteristics analyzed for a Category 2 plant as shown in PWROG 14015 and PWROG 14027.
		
		Applicable Supporting Documents* - ePortal NRC Request 27 and 31:
		• "WBN SE Trker Rx Sys Open Item Response"
		• Calculation EPMMA041592, "Station Blackout Coping Evaluation"
		• Drawings:
		  ◦ 1 and 2-47W809-1
		  ◦ 47W406-6 through 10
		  ◦ 47W406-313, 327, 336, 338, 352, and 353
		  ◦ 2-47W406-313, 313a, 352, 353, 370, and 370a
		  ◦ WBN RCP Seal Leakoff Piping.pdf for WBN specific PWROG 14015-P Table 2 parameters

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Safety Evaluation Review Item 4	Please provide adequate justification for the seal leakage rates calculated according to the Westinghouse seal leakage model that was revised following the issuance of NSAL-14-1. The justification should include a discussion of the following factors: a. benchmarking of the seal leakage model against relevant data from tests or operating events, b. discussion of the impact on the seal leakage rate due to fluid temperatures greater than 550°F resulting in increased deflection at the seal interface, c. clarification whether the second-stage reactor coolant pump seal would remain closed under ELAP conditions predicted by the revised seal leakage model and a technical basis to support the determination, and, d. justification that the interpolation scheme used to compute the integrated leakage from the reactor coolant pump seals from a limited number of computer simulations (e.g., three) is realistic or conservative. Open Item 4: Adequate justification has not been provided to support the analytical modeling of reactor coolant pump seal leakage, including benchmarking of the analytical model against test or operational data that is representative of ELAP conditions. (SE Tracker 4-E) Open Item 7: The licensee has not provided sufficient information to demonstrate that the second-stage RCP seals will remain fully closed during the ELAP event, as has been assumed. (SE Tracker 4-E)	WBN is crediting the PWROG's on-going effort regarding RCP seals including the Westinghouse/EDF seal benchmarking effort. Applicable Supporting Documents* - ePortal NRC Request 27: • "WBN SE Trker Rx Syst Open Item Response" • LTR-FSE-14-97, "Westinghouse Input to Watts Bar Open Items, 2, 4, 5 and 7 Supporting Implementation of Order EA-12-049" • LTR-TSE-13-87, "Watts Bar Unit 1 and Unit 2 Plant-Specific Evaluation of Significant PWROG Generic NSSS Parameters Supporting FLEX Integrated Plan" • LTR-SEE-III-15-27, "Summary of 8 inch No. 2 Seal Performance Following Loss of All Seal Cooling"

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Safety Evaluation Review Item 5	The NRC staff understands that Westinghouse has recently recalculated seal leakoff line pressures under loss of seal cooling events based on a revised seal leakage model and additional design-specific information for certain plants. a. Please clarify whether the piping and all components (e.g., flow elements, flanges, valves, etc.) in your seal leakoff line are capable of withstanding the pressure predicted during an ELAP event according to the revised seal leakage model. b. Please clarify whether operator actions are credited with isolating low-pressure portions of the seal leakoff line, and if so, please explain how these actions will be executed under ELAP conditions. c. If overpressurization of piping or components could occur under ELAP conditions, please discuss any planned modifications to the seal leakoff piping and component design and the associated completion timeline. d. Alternately, please identify the seal leakoff piping or components that would be susceptible to overpressurization under ELAP conditions, clarify their locations, and provide justification that the seal leakage rate would remain in an acceptable range if the affected piping or components were to rupture. Open Item 5: Adequate justification has not been provided to support the conclusion that first-stage seal leakoff line piping and associated components can withstand the peak pressure that would be experienced under ELAP conditions, accounting for transient behavior. (SE Tracker 5-E)	A WBN specific Maximum Pressure in No. 1 Seal Leak-off Line Piping Following a Loss of Seal Cooling was provided. Applicable Supporting Documents* - ePortal NRC Request 32: • Westinghouse LTR-SEE-III-15-1, “Maximum Pressure in No. 1 Seal Leak-off Line Piping Following a Loss of Seal Cooling at Watts Bar Units 1 and 2”

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Audit Item Reference	Item Description	Licensee Input Provided
Safety Evaluation Review Item 6	Licensee was requested by email from Jason Paige dated 9/22/14 to: Please provide clarification on the potential discrepancy and to verify if TVA will or will not have a boration unit for Phase 3. If WBN will NOT have a unit, what is WBN's plans for a long-term source of borated water? Or justify there is enough borated water on site for all external events. Note the following: • Page 51 of 63 from ISE states "In addition, a mobile purification and a mobile boration unit will be utilized for cleaning the raw water source during long term coping in Phase 3." • Also see response to Audit Question 51. • Page E-34 from Feb 7, 2014 OIP states "Phase 3 deployment of a unit capable of generating borated water from the water processed through the purification unit can further extend coping times with respect to RCS inventory management." • The licensees Aug 2014 update indicates that no changes were made to the Feb 2014 revised OIP The licensee responded by email dated 10/14/14 and indicated that a mobile boration unit is no longer being brought as off-site equipment. In additional the licensee provide information regarding the use of bags of boric acid and use of boron staged to be used by the Auxiliary Boration System. Ultimately, licensee needs to explain: what is the strategy for providing borated coolant for an indefinite ELAP coping period, and why is this strategy sufficient to comply with Order EA-12-049? Open Item 1: The licensee has not provided sufficient information regarding (1) the equipment that would be credited with preparing and injecting borated makeup over an indefinite coping period for both the non-flooding and flooding scenarios, (2) a description of whether any credited installed equipment is robust to natural hazards of design-basis magnitude, (3) whether filtration equipment would be used to prevent debris suspended in raw water sources from being introduced into the reactor vessel, and (4) the long-term leakage rate from the reactor coolant system that would need to be offset by borated makeup. (SE Tracker 6-E)	WBN will have mobile boration units available for Phase 3. The WBN Integrated Plan was revised to credit mobile boration units and a draft copy of the changes was provided. Applicable Supporting Documents* - ePortal NRC Request 32: • "Draft WBN FIP Revision for Boration"

*Documents either provided on the ePortal or reviewed by NRC during the audit process

Enclosure 3

TENNESSEE VALLEY AUTHORITY WATTS BAR NUCLEAR PLANT UNITS 1 AND 2, FLEX FINAL INTEGRATED PLAN, Revision 1 (Text Only)

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT

UNITS 1 AND 2

FLEX

FINAL OVERALL INTEGRATED PLAN

Revision 1

Prepared by: __Original signed by ________/__3/2/2015_
Leonard Bush Date

Reviewed By: _Original signed by_______/__3/2/2015_
Brian Briody Date

Approved By: _Original signed by_______/___3/2/2015
Robert C. Williams, Jr Date

Revision Log

Revision	Description
0	Initial Issue
1	A revision to the FIP text was necessary to address changes resulting from resolution of open items related to the addition of the mobile boration unit from the National SAFER Response Center and a change in the cooldown strategy to hold at a steam generator pressure of 300 psig. Additionally, changes were made on Page E-10 to clarify long term actions regarding diesel fuel service, and page E-11 correcting the second note to state that flood and non-flood mode use the same strategy for steps 1 - 12. The voided EDCR 60994 was deleted.

General Integrated Plan Elements Watts Bar Units 1 and 2	
Determine Applicable Extreme External Hazard **Ref: NEI 12-06 Section 4.0 -9.0** **JLD-ISG-2012-01 Section 1.0**	

The Watts Bar site has been evaluated and the following applicable hazards have been identified:

- Seismic events
- External flooding
- Severe storms with high winds
- Snow, ice, and extreme cold
- Extreme heat

The Watts Bar site has been reviewed against the Nuclear Energy Institute (NEI) guidance document NEI 12-06 (Reference 2) and determined that the hazards Flexible and Diverse Coping Mitigation Strategies (FLEX) equipment should be protected from include seismic; external flooding; severe storms with high winds; snow, ice and extreme cold; and extreme high temperatures. Watts Bar has determined the functional threats from each of these hazards and identified FLEX equipment that may be affected. The FLEX storage locations provide the protection required from these hazards. Watts Bar has developed procedures and processes to address plant strategies for responding to these various hazards.

Seismic:

Per NEI 12-06 (Reference 2), seismic hazards must be considered for all nuclear sites. As a result, the credited FLEX equipment has been assessed based on the current WBN seismic licensing basis, with margin added as indicated below, to ensure that the equipment remains accessible and functional after a Beyond Design Basis External Event (BDBEE) and that the FLEX equipment does not become a target or source of a seismic interaction from other systems, structures or components. WBN safe shutdown earthquake (SSE) requirements are 0.18g horizontal and 0.12g vertical maximum ground accelerations (References 4 and 5, Sections 2.5.2.4 and 2.5.2.7). For an operating basis earthquake (OBE), the maximum horizontal and vertical ground accelerations are 0.09g and 0.06g, respectively. The FLEX strategies developed for WBN include documentation ensuring that the storage locations and deployment routes meet the FLEX seismic criteria.

In addition to the NEI 12-06 guidance, Near-Term Task Force (NTTF) Recommendation 2.1, Seismic, required that facilities re-evaluate the site's seismic hazard. This seismic hazard re-evaluation requirement has introduced risk to the appropriateness of limiting the design parameters for mitigating strategies equipment robustness to a facility's original design basis.

Watts Bar subsequently reevaluated its Ground Motion Response Spectra (GMRS) based upon the most recent seismic data and methodologies, and has found that the existing SSE does not envelop the new GMRS at low frequencies for WBN. This liability along with the recognized challenge to perform NTTF Recommendation 2.1 required risk evaluations, via either Seismic Margins Assessment (SMA) or Seismic PRA, is being addressed in the EPRI initiative referred to as the Augmented Approach (EPRI Report 3002000704). The Augmented Approach, in addition to allowing more time to complete the site-specific seismic risk evaluations, also requires plants to address the increase in seismic susceptibility of FLEX equipment. The Augmented Approach ensures that FLEX credited equipment (both currently installed and new) would retain function during and after a beyond design basis seismic event using seismic margins assessment criteria, by calculating a High Confidence of Low Probability Failure (HCLPF) seismic capacity and comparing that to the seismic demand of a Review Level Ground Motion (RLGM), capped to 2 x SSE from 1 to 10 Hz.

NRC endorsement of use of the EPRI Augmented Approach was provided in Reference 25.

Therefore, WBN FLEX credited equipment is designed to achieve a HCLPF capacity based on a seismic RLGM demand equal to 2 x SSE (Reference 26).

Liquefaction

TVA has assessed the potential liquefaction of its FLEX deployment routes and determined that the primary and backup deployment routes are not subject to detrimental liquefaction. (Reference 22)

External Flooding:

The types of events evaluated to determine the worst potential flood included (1) probable maximum storm on the total watershed and critical sub-water sheds including seasonal variations and potential consequent dam failures, and (2) dam failures in a postulated SSE or OBE with guide specified concurrent flood conditions.

Those safety-related facilities, systems, and equipment located in the containment structure are protected from flooding by the Shield Building structure with those accesses and penetrations below the maximum flood level designed and constructed as watertight elements (References 4 and 5, Section 2.4.6). From References 4 and 5, Section 2.4.3.6, the Diesel Generator (DG) Buildings to the north and the pumping station to the southeast of the main building complex must be protected from flooding to assure plant safety. The DG Building's operating floors are at elevation 742.0 ft., which are above the maximum computed elevation, including wind wave run-up. Per References 4 and 5, Section 2.4.14.2.3, the Intake Pumping Station (IPS) is designed to retain full functional capability to maintain cooling of plant loads. All equipment required to maintain the plant safely during the flood is either designed to operate submerged, is located above the maximum flood level, or is otherwise protected.

Specific analysis of Tennessee River flood levels resulting from ocean front surges and tsunamis is not required because of the inland location of the plant (References 4 and 5, Section 2.4.6). Snow melt and ice jam considerations are also unnecessary because of the temperate zone location of the plant (References 4 and 5, Sections 2.4.2.2 and 2.4.7). Flood waves from landslides into upstream reservoirs required no specific analysis, in part because of the absence of major elevation relief in nearby upstream reservoirs and because the prevailing thin soils offer small slide volume potential compared to the available detention space in reservoirs (References 4 and 5, Section 2.4.2.2). Seiches pose no flood threats because of the size and configuration of the lake and the elevation difference between normal lake level and plant grade (References 4 and 5, Sections 2.4.2.2 and 2.4.5).

Per References 4 and 5, Section 2.4.2.2, the maximum plant site flood level from any cause is elevation 734.9 ft. This information has been superseded by Reference 9. The maximum plant site flood level from any cause is elevation 739.2 ft. (still reservoir). This elevation would result from the probable maximum storm. Coincident wind wave activity results in wind waves of up to 2.2 ft. (crest to trough). Run up on the 4:1 slopes approaching the Diesel Generator Building reaches elevation 741.6 ft. Wind wave run up on the critical wall of the Intake Pumping Station reaches elevation 741.7 ft. and wind wave run up on the walls of the Auxiliary, Control and Shield Buildings reaches elevation 741.0 ft. (Reference 9).

In summary, all equipment required to maintain the plant safety during all flooding events including the design basis flood (DBF) is either designed to operate submerged, is located above the maximum flood level, or is otherwise protected. Accordingly, FLEX strategies have been developed for consideration of external flooding hazards. In addition, WBN has developed strategies and procedures for delivery of offsite FLEX equipment during Phase 3 which considers regional impacts from flooding. (Reference 31)

High Wind:

Figures 7-1 and 7-2 from Reference 2 were used for this assessment.

WBN is susceptible to hurricanes as the plant site is within the contour lines shown in Figure 7-1 of Reference 2.

It was determined the WBN site has the potential to experience damaging winds caused by a tornado exceeding 130 mph. Figure 7-2 of Reference 2 indicates a maximum wind speed of 200 mph for Region 1 plants, including Watts Bar. Therefore, high-wind hazards are applicable to the Watts Bar site.

In summary, based on available local data and Figures 7-1 and 7-2 of Reference 2, WBN is susceptible to severe storms with high winds so the hazard is screened in.

Snow, Ice, and Extreme Cold

Per the FLEX guidance all sites should consider the temperature ranges and weather conditions for their site in storing and deploying their FLEX equipment. That is, the equipment procured should be suitable for use in the anticipated range of conditions for the site, consistent with normal design practices.

Applicability of snow and extreme cold:

The Watts Bar Site is located approximately 50 miles northeast of Chattanooga in Rhea County, Tennessee, on the west bank of the Tennessee River at mile 528. The site is approximately 1-1/4 miles south of the Watts Bar Dam and approximately 31 miles north-northeast of the Sequoyah Nuclear Plant (References 4 and 5, Section 2.1.1.1). The approximate site location is given below, from References 4 and 5, Section 2.1.1.1:

LATITUDE (degrees/minutes): 35°36' N
LONGITUDE (degrees/minutes): 84°47' W

From References 4 and 5, Section 2.3.2.2, mean temperatures at the Watts Bar site have been in the low 40s°F in the winter. Extreme minima temperatures recorded were -20°F at Decatur and -10°F at Chattanooga in the winter.

Outside environment normal operational conditions from Environmental Data Environment Drawing 47E235-36 are given as Average 60, Maximum 95°F and Minimum 13°F. These temperatures were used as a basis in establishing Operational Abnormal temperatures of Maximum 102°F and Minimum 6°F temperatures. This condition could exist for up to 12 hours per excursion and will occur less than 1% of plant life. (Reference 21).

Reference 2 states plants above the 35th parallel should provide the capability to address the hindrances caused by extreme snow and cold. The Watts Bar site is above the 35th parallel; therefore, the FLEX strategies must consider the hindrances caused by extreme snowfall with snow removal equipment, as well as the challenges that extreme cold temperature may present.

Applicability of ice storms:

The Watts Bar site is not a Level 1 or 2 region as defined by Figure 8-2 of Reference 2; therefore, the FLEX strategies must consider the hindrances caused by ice storms.

In summary, based on the available local data and Figures 8-1 and 8-2 of Reference 2, the Watts Bar site does experience significant amounts of snow, ice, and extreme cold temperatures; therefore, the hazard is screened in.

Extreme Heat:

Per Reference 2, all sites must address high temperatures. Virtually every state in the lower 48 contiguous United States has experienced temperatures in excess of 110°F. Many states have experienced temperatures in excess of 120°F. Sites that should address high temperatures should consider the impacts of these conditions on the FLEX equipment and its deployment. From References 4 and 5, Section 2.3.2.2, mean temperatures at the Watts Bar site can reach the upper 70s°F in the summer. Extreme maxima temperature recorded was 108°F at Decatur, Tennessee and 106°F at Chattanooga, Tennessee in the summer.

Outside environment normal operational conditions from Environmental Data Environment Drawing 47E235-36 are given as Average 60, Maximum 95°F and Minimum 13°F. These temperatures were used as a basis in establishing Operational Abnormal temperatures of Maximum 102°F and Minimum 6°F temperatures. This condition could exist for up to 12 hours per excursion and will occur less than 1% of plant life. (Reference 21).

Therefore, for selection of FLEX equipment, the Watts Bar site considered the site maximum expected temperatures in their specification, storage, and deployment requirements, including ensuring adequate ventilation or supplementary cooling, if required.

<table>
<tr><th colspan="2"></th></tr>
<tr><td>Key Site assumptions to implement NEI 12-06 strategies.

Ref: NEI 12-06 Section 3.2.1</td><td>Provide key assumptions associated with implementation of FLEX Strategies:

Assumptions are consistent with those detailed in NEI 12-06, Section 3.2.1. Analysis has been performed consistent with the recommendations contained within the Executive Summary of the Pressurized Water Reactor Owners Group (PWROG) Core Cooling Position Paper (Reference 13) and assumptions from that document are incorporated in the plant specific analytical bases.</td></tr>
</table>

NEI 12-06 Assumptions

The initial plant conditions are assumed to be the following:

- Prior to the event the reactor has been operating at 100 percent rated thermal power for at least 100 days or has just been shut down from such a power history as required by plant procedures in advance of the impending event.
- At the time of the postulated event, the reactor and supporting systems are within normal operating ranges for pressure, temperature, and water level for the appropriate plant condition. All plant equipment is either normally operating or available from the standby state as described in the plant design and licensing basis.

The following initial conditions are to be applied:

- No specific initiating event is used. The initial condition is assumed to be a loss of offsite power (LOOP) at a plant site resulting from an external event that affects the off-site power system either throughout the grid or at the plant with no prospect for recovery of off-site power for an extended period. The LOOP is assumed to affect all units at a plant site.
- All installed sources of design basis emergency on-site ac power and station blackout (SBO) alternate ac power sources are assumed to be not available and not imminently recoverable.
- Cooling and makeup water inventories contained in systems or structures with designs that are robust with respect to seismic events, floods, and high winds, and associated missiles are available.
- Normal access to the ultimate heat sink (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.
- Fuel for FLEX equipment stored in structures with designs which are robust with respect to seismic events, floods and high winds and associated missiles, remains available.
- Permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, and 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 50.54(hh) (2), may be used provided it is reasonably protected from the applicable external hazards per Sections 5 through 9 and Section 11.3 of NEI 12-06 and has predetermined hookup strategies with appropriate procedures/guidance and the equipment is stored in a relative close vicinity of the site.
- Installed electrical distribution system, including inverters and battery chargers, remain available provided they are protected consistent with current station design.
- No additional events or failures are assumed to occur immediately prior to or during the event, including security events.
- Reliance on the fire protection system ring header as a water source is acceptable only if the header meets the criteria to be considered robust with respect to seismic events, floods, and high winds, and associated missiles.

The following additional boundary conditions are applied for the reactor transient:

- Following the loss of all ac power, the reactor automatically trips and all rods are inserted.
- The main steam system valves (such as main steam isolation valves, turbine stops, atmospheric dumps, etc.), necessary to maintain decay heat removal functions operate as designed.
- Safety/Relief Valves (S/RVs) or Power Operated Relief Valves (PORVs) initially operate in a normal manner if conditions in the reactor coolant system (RCS) so require. Normal valve reseating is also assumed.
- No independent failures, other than those causing the extended loss of alternating current (ac) power (ELAP)/loss of normal access to the ultimate heat sink (LUHS) event, are assumed to occur in the course of the transient.

Sources of expected pressurized water reactor (PWR) reactor coolant inventory loss include:

- Normal system leakage
- Losses from letdown unless automatically isolated or until isolation is procedurally directed
- Losses due to reactor coolant pump (RCP) seal leakage.

The initial spent fuel pool (SFP) conditions are:

- All boundaries of the SFP are intact, including the liner, gates, transfer canals, etc.
- Although sloshing may occur during a seismic event, the initial loss of SFP inventory does not preclude access to the refueling deck around the pool.
- SFP cooling system is intact, including attached piping.
- SFP heat load assumes the maximum design basis heat load for the site.

Containment Isolation Valves:

- It is assumed that the containment isolation actions delineated in current SBO coping capabilities are sufficient.

Assumptions Specific to Watts Bar Site

A1. The Auxiliary Feedwater Supply Tank (AFWST) and associated piping are seismically qualified or hardened against missiles and tornados. Watts Bar's AFWST is qualified to be robust with respect to high winds and seismic events.

A2. Watts Bar Unit 1 is a mirror image of Unit 2, with only minor differences existing between plants. For this reason, any sections or sketches which are only shown for a single unit would be directly analogous to the other unit.

A3. The design hardened connections added for the purposes of FLEX are protected against external events or are established at multiple and diverse locations.

A4. Flood and seismic re-evaluations pursuant to the Title 10 of the Code of Federal Regulations (10 CFR) 50.54(f) letter of March 12, 2012, are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action program.

A5. Required staffing levels have been determined consistent with guidance contained in NEI 12-06 for each of the site specific FLEX strategies. Assumed available staffing levels will be determined consistent with NEI 12-01, as described below.

A. Post event time: 6 hours – No site access. This duration reflects the time necessary to clear roadway obstructions, use different travel routes, mobilize alternate transportation capabilities (e.g., private resource providers or public sector support), etc.

B. Post event time: 6 to 24 hours – 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).

C. Post event time: 24+ hours – 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.

A6. Watts Bar has designed and constructed one new storage location to protect portable FLEX equipment against all five external hazards. This location is referred to in this document as the FLEX Equipment Storage Building (FESB). At present, the FESB is located outside the Protected Area boundary but close to access portals. FLEX equipment will be stored/staged in the FESB or inside of site Class I structures.

A7. Instrumentation on FLEX equipment and/or plant process instrumentation will be used to confirm continual performance.

A8. This plan defines strategies capable of mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink resulting from a beyond-design-basis event by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at all units on a site. Though specific strategies have been developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety have been incorporated into the site emergency operating procedures in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59. The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the beyond-design-basis event may place the plant in a condition where it cannot comply with certain Technical Specifications and/or with its Security Plan, and as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p). (Reference 12)

Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06, are being followed. **Identify any deviations to JLD-ISG-2012-01 and NEI 12-06.** **Ref: JLD-ISG-2012-01** **Ref: NEI 12-06 Section 13.1**	Watts Bar Nuclear Plant is using pre-staged 480v (225KVA) and 6900v (3 MW) FLEX Diesel Generators and pre-staged pumps that will be powered through the existing electrical distribution system as a part of the mitigation strategy integrated plan. This was identified as an alternative approach from the strategies identified in NEI 12-06, as endorsed by NRC in JLD-ISG-2012-01, due to reliance on permanently installed plant structures and systems (i.e., electrical distribution system) and components (pre-staged diesel generators and pumps) in lieu of reliance on complete deployment and alignment of portable generators and diesel driven pumps to accomplish an ELAP event mitigation. (References 33 and 34)

Watts Bar Nuclear plans to comply with the guidance in JLD-ISG-2012-01 (Reference 3) and NEI 12-06 (Reference 2) in implementing FLEX strategies for the Watts Bar site except for the alternatives to the guidance as stated above.

Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint. **Ref: NEI 12-06 Section 3.2.1.7** **JLD-ISG-2012-01 Section 2.1**	*Describe in this section the sequence of events and technical basis for the time constraint or time sensitive activity identified in Attachment 1A.* *See Attachment 1A.*

The sequence of events and any associated times constraints are identified below for Watts Bar Reactor Core Cooling and Heat Removal (steam generators available) strategies for FLEX Phases 1 through Phase 3. See Attachment 1A for timeline time constraint or time sensitive activities and Attachment 1B for technical basis support information.

Discussion of sequence of event action items: (Non-Flood Event)

1. Declare ELAP – ELAP entry conditions can be verified by control room staff and it is validated that emergency diesel generators are not available. This step is time sensitive and needs to occur within 1 hour following the start of the event to provide operators with guidance to perform ELAP actions.
2. Align and place in service the 225 kva 480v AC Diesel Generators (480v FLEX Generators). This provides charging current to the 125v DC Vital Batteries and ensures 125v DC Vital Battery power (control) and through the Vital Inverters 120v AC Vital Instrument Power (instrument indication).
3. Verify 125v DC Vital Chargers energized and supplying required load to the 125v DC Vital Batteries.
   IF not,
   THEN complete Extended Load Shed for any Vital Battery not being supplied its required load within 90 minutes (1.5 hours) following the start of the event. This ensures 8-hour coping time for the 125v DC Vital Batteries. (Reference 30).
4. Debris Removal (Access) - The earliest need for debris removal access paths is to support alignment of the Low Pressure (LP) FLEX Pumps to the Essential Raw Cooling Water system (ERCW) headers at the IPS. This process will be initiated in order to support FLEX equipment deployment depending on the resources available.
5. Initiate Damage Assessment - Watts Bar has developed a post event damage assessment procedure. The damage assessment will evaluate and document the condition of plant systems, structures and components (SSCs) after an ELAP event. The assessment is consistent with the guidelines contained in supplement 5 of Reference 16.
6. Stage and align the LP FLEX pumps (Dominator and Triton) - staged and aligned to take suction from the intake channel with discharge routed to the ERCW FLEX connections inside the IPS. An alternate or additional raw water source could come from the Condenser Circulating Water (CCW) Cooling Tower basin supplying suction to a Dominator LP FLEX Pump with its discharge routed to ERCW FLEX (or B.5.b) connections at the 5th DG Building.
7. Initiate RCS depressurization and cooldown to commence as soon as possible due to RCP seal failure probability. At rated pressure a potential leakage rate of 20.3 gpm per RCP following the event is possible. At a cold leg pressure of 1485 psig a potential leakage rate of 23.6 gpm per RCP is possible. (Reference 35 & Reference 55). An RCS cooldown rate of 75-100 °F per hour should be sustained until stabilized at ~ 300 psig Steam Generator (SG) Pressure. Maintain RCS pressure greater than 250 psig to avoid Cold Leg Accumulator (CLA) nitrogen injection into the RCS. The CLAs are maintained at a boron concentration of 3100 - 3300 ppm. Cooldown and depressurization to 300 psig SG pressure should be stabilized within 4 hours.

Note: The Technical Support Center (TSC) will direct when the reduction to the long term cooling plateau of 160 psig SG pressure will take place.

8. Complete 3 MWe FLEX Diesel Generators (6.9KV FLEX Generators), 6.9KV Shutdown Boards and emergency feeder breakers and 480v Shutdown Board alignment. This is to ensure switching at the EDG building and shutdown board rooms are complete, potential board loading is reduced and interlocks are cleared to allow the emergency feeder breaker to be used to safely power the 6.9KV Shutdown Boards from the 6.9KV FLEX DG.

9. Energize the 6.9KV Shutdown Boards with the 6.9KV FLEX DGs. Place the following components in service and restore pressurizer level (RCS inventory): Component Cooling System (CCS) Pumps and Safety Injection Pumps (SIPs), as required, to recover and maintain RCS Pressurizer level. The SIPs take suction from the RWST which maintains a boron concentration of between 3100 and 3300 ppm.

Note: While the TDAFWP is not anticipated to fail, a secondary source of steam generator makeup can be provided by the MDAFWPs, if required, as soon as the 6.9KV FLEX DGs are in service. The Intermediate Pressure (IP) FLEX pumps will be staged and aligned as soon as feasible (within 24 hours).

10. Place the following equipment in service, if required: Verify 6.9KV FLEX DG loading between starts. Auxiliary Air Compressors, Motor Driven Auxiliary Feedwater Pumps (MDAFWPs) and/or Spent Fuel Pool (SFP) Cooling Pump.

Note: 480v FLEX DGs fuel and power line connections could be initiated earlier if resources are available.

11. Complete 480v FLEX DGs power and fuel line connections (between connection points at the EDG Building South wall to connection points at the North wall of Auxiliary Building) and deploy required protection per design requirements. Connections must be complete and verified.

Note: The realignment of ERCW headers are parallel responsibilities for assigned AUOs and ROs. The majority of the realignment will be accomplished by closure of motor operated valves (MOVs) once the Reactor MOV Boards are repowered by the 6.9KV FLEX DGs.

12. Initiate alignment of ERCW headers to ensure cooling water supplied by the LP FLEX pumps are efficiently directed to support FLEX strategies.

13. Stage and align the High Pressure (HP) FLEX pumps (AB elevation 692). The primary suction alignment is from the Refueling Water Storage Tanks (RWST) which maintains a boron concentration of 3100-3300 ppm. The secondary suction alignment is from the Boric Acid Tanks (BATs) which maintain a boron concentration of ~ 6900 ppm. Complete final valve alignment and energizing of the 480v AC power supply to the pumps when required.

14. Stage and align the IP FLEX Pumps at the AFWST as backup for SG makeup (backup to the TDAFWPs and MDAFWPs). Suction is aligned from the AFWST and discharge can be routed to FLEX connections upstream of the TDAFWP Level Control Valves (LCVs) (primary) or MDAFWP LCVs (alternate). These IP FLEX Pumps for non-flood event scenarios are diesel driven.

15. Deploy hoses and spray nozzles to the SFP area as a contingency. Hoses can be routed to supply makeup from FLEX connections on the refuel floor or from the elevation below the refuel floor. This ensures makeup capability prior to the most limiting SFP time when boil off initiates. (Reference 18).

16. Initiate diesel fueled portable FLEX equipment refueling operations within 7 - 8 hours. The 500 gallon tank on at least one of the FLEX trucks should be filled to support FLEX equipment refueling operations by 8 hours from event initiation. Diesel powered FLEX equipment's onboard fuel supply will require replenishment within 10 hours from start of operation.

17. Once directed by the TSC and RCS inventory has been restored by SIP operation, calculated boration and required mixing completed (required SDM verified) and CLAs isolated to ensure against nitrogen injection into the RCS, reduce SG pressure to 160 psig per ECA-0.0.

Note: If the Condensate Storage Tanks (CSTs) survive the event they will supply additional clean water reserve per unit to the Auxiliary Feedwater Pumps.

18. The AFWST will be depleted in approximately 15 hours, makeup options will need to be evaluated and directed. (Reference 46). Potential sources of clean water makeup are the Demineralized Water Storage Tank (DWST), U1 and U2 Primary Water Storage Tanks (PWST) and the Tritiated Water Storage Tank (TWST). If the AFWST is depleted the operating auxiliary feedwater pumps' suction will be realigned to the ERCW headers to extend core cooling. The LP FLEX pumps have been aligned to the ERCW headers to provide a raw water input prior to the AFWST depleting. Available raw water in the ERCW headers (without LP FLEX pumps supply) will deplete in 7 hours for Unit 1 and 4.7 hours for Unit 2 (Reference 23).
19. Initiate portable lighting for MCR, Shutdown Board Room and FLEX equipment locations as required. This is not a time constraint. The MCR and Shutdown Board Rooms are provided with battery backup lighting. Portable lighting for FLEX equipment staging locations could be required. Portable lighting will be available for internal and external service, if required.
20. Complete ERCW header alignments to ensure ERCW pressures and flows for long term FLEX needs within 12 hours of the event.

Note: Doors to rooms where systems and/or components are in service or in operation should be blocked open to facilitate natural ventilation (i.e., Vital Battery rooms, TDAFWP rooms, SIP rooms).

21. The Vital Battery Room and Shutdown Board Room heating, ventilation, and air conditioning (HVAC) study determined that ventilation is not required until 24 hours into the ELAP event; at which point it can be monitored periodically, if needed (Reference 14).
22. The Main Control Room HVAC study determined that ventilation is not required until 24 hours into ELAP event; at which point it can be monitored periodically, if needed (Reference 14).
23. The TDAFWP room HVAC study determined that ventilation is not required until 24 hours into ELAP event; at which point it can be monitored periodically, if needed (Reference 14).
24. Venting of the SFP area will need to be evaluated within 24 hours based on the SFP time when boil off occurs. (Reference 18).
25. A time of 72 hours is assumed for staging and alignment of the mobile water purification units and mobile boration units. The water purification units will provide clean water to refill the AFWST and makeup to the mobile boration skids. However, cooling water for SG makeup via the ERCW headers is available to be provided indefinitely, if required.
26. Evaluate, identify and address (within 72 hours)long term needs including site diesel fuel service.

Discussion of action items identified in Attachment 1A Table: (Flood Event)

Note: An ELAP could occur at anytime during flood preparation or a flood event, therefore FLEX equipment and strategies must be staged and ready for implementation, if required.

Note: During a Design Basis Flood Mode response, prior to flood waters exceeding plant grade, the EDGs are placed in service supplying plant safety related loads designed for flood mode operations and plant offsite power supplies are removed from service. Plant generation would have been removed from service prior to Flood Mode Stage II entry. Once in Design Basis flood mode operation configuration with EDGs in service supplying safety related loads (ERCW pumps, High Pressure Fire Protection pumps, Spent Fuel Pool Circulation pumps, RCP Thermal Barrier Booster Pumps, Flood Mode Boration System, etc.), the probability of an ELAP event is remote. Design Basis Flood Mode Operations are controlled by AOI-7.01, Maximum Probable Flood.

Note: To assure that FLEX response actions do not impact on design basis flood mode preparations, Watts Bar will pre-stage FLEX Flood Mode equipment based on a 25 year flood warning from TVA's River Operations Forecasting group. Concurrent with full FLEX implementation at Watts Bar, River

Operations procedure RvM-SOP-10.05.06, “Nuclear Notifications and Flood Warning Procedure,” and AOI-7.01, “Maximum Probable Flood,” have been revised to provide the notification and direct the pre-staging of FLEX equipment. (Reference 44).

Note: The scenario described below assumes an ELAP event occurs post initial flood warning received from TVA’s River System Operations and prior to a Stage 1 warning notification. This provides a 27 hour period before flood waters reach grade elevation. This flood preparation time period allows for initial use of the same strategy as a non-flood event for Steps 1-12 for stabilizing the plant and staging FLEX equipment for flood mitigation strategy.

1. Declare ELAP – ELAP entry conditions can be verified by control room staff and it is validated that emergency diesel generators are not available. This step is time sensitive and needs to occur within 1 hour following the start of the event to provide operators with guidance to perform ELAP actions.
2. Align and place in service the 225 kva 480vAC Diesel Generators (480v FLEX Generators). This provides charging current to the 125v DC Vital Batteries and ensures 125v DC Vital Battery power (control) and through the Vital Inverters 120v AC Vital Instrument Power (instrument indication).
3. Verify 125v DC Vital Chargers energized and supplying required load to the 125v DC Vital Batteries. IF not,
   THEN complete Extended Load Shed for any Vital Battery not being supplied its required load within 90 minutes (1.5 hours) following the start of the event. This ensures 8-hour coping time for the 125v DC Vital Batteries. (Reference 30).
4. Debris Removal (Access) - The earliest need for debris removal access paths is to support alignment of the LP FLEX Pumps to the ERCW headers at the IPS. This process will be initiated in order to support FLEX equipment deployment depending on the resources available.
5. Damage Assessment - Watts Bar has developed a post event damage assessment procedure. The damage assessment will evaluate and document the condition of plant systems, structures and components (SSCs) after an ELAP event. The assessment will be consistent with the guidelines contained in supplement 5 of Reference 16.
6. Stage and align the LP FLEX pumps (Dominator and Triton) - staged and aligned to take suction from the intake channel with discharge routed to the ERCW FLEX connections inside the Intake Pumping Station (IPS). An alternate or additional raw water source could come from the Condenser Circulating Water (CCW) Cooling Tower basin supplying suction to a Dominator LP FLEX Pump with its discharge routed to ERCW FLEX (or B.5.b) connection at the 5th DG Building.
7. Initiate RCS depressurization and cooldown to commence as soon as possible due to RCP seal failure probability. At rated pressure a potential leakage rate of 20.3 gpm per RCP following the event is possible. At a cold leg pressure of 1485 psig a potential leakage rate of 23.6 gpm per RCP is possible. (Reference 35 & Reference 55). An RCS cooldown rate of 75-100 °F per hour should be sustained until stabilized at ~ 300 psig Steam Generator (SG) Pressure. Maintain RCS pressure greater than 250 psig to avoid Cold Leg Accumulator (CLA) nitrogen injection into the RCS. The CLAs are maintained at a boron concentration of 3100 - 3300 ppm. Cooldown and depressurization to 300 psig SG pressure should be stabilized within 4 hours.

Note: The Technical Support Center (TSC) will direct when the reduction to the long term cooling plateau of 160 psig SG pressure will take place.

8. Align the 3MWe FLEX Diesel Generators (6.9KV FLEX Generators), 6.9KV Shutdown Boards and 480v Shutdown Boards for FLEX DG operation. This is to ensure switching at the EDG building and shutdown board rooms are complete, potential board loading is reduced and interlocks are cleared to allow the emergency feeder breaker to be used to safely power the 6.9KV Shutdown Boards from the 6.9KV FLEX DG.
9. Energize the 6.9KV Shutdown Boards with the 6.9KV FLEX DGs. Place the following components in

service and restore pressurizer level: Component Cooling System Pumps (CCS) and Safety Injection Pumps (SIPs), as required, to recover and maintain RCS Pressurizer level. The SIPs take suction from the RWST which maintains a boron concentration of between 3100 and 3300 ppm.

Note: While the TDAFWP is not anticipated to fail, a secondary source of steam generator makeup can be provided by the MDAFWPs, if required, as soon as the 6.9KV FLEX DGs are in service.

10. Place the following equipment in service, if required: Verify 6.9KV FLEX DG loading between starts. Auxiliary Air Compressors, MDAFWPs and/or Spent Fuel Pool (SFP) Cooling Pump.

Note: 480v FLEX DGs fuel and power line connections could be initiated earlier if resources are available.

11. Complete 480v FLEX DGs power and fuel line connections (between connection points at the EDG Building South wall to connection points at the North wall of Auxiliary Building) and deploy required protection per design requirements. Connections must be complete and verified.

Note: The realignment of ERCW headers are parallel responsibilities for assigned AUOs and ROs. The majority of the realignment will be accomplished by closure of MOVs once the Reactor MOV Boards are repowered by the 6.9KV FLEX DGs.

12. Initiate alignment of ERCW headers to ensure cooling water supplied by the LP FLEX pumps are efficiently directed to support FLEX strategies.

Note: The above Design Basis components that are below Probable Maximum Flood (PMF) elevation will be removed from service and protection transitioned to the FLEX strategies prior to flood waters reaching plant grade.

Note: The Auxiliary Feedwater Supply Tank (AFWST) will not be available as a water source once flood water reaches plant grade.

Note: If deployed, verify raw water supply to the ERCW headers from a LP FLEX Pump (Dominator) staged at the CCW Cooling Tower basin, isolate the ERCW FLEX connections inside the IPS and recover the LP FLEX Pumps (Dominator and Triton) staged at the Intake Pumping Station prior to flood waters exceeding their staging location. Relocate these pumps to the staging area north of the EDG Building (above PMF level).

13. Stage and align a complete set of LP FLEX pumps (Dominator and Triton) to take suction from the road just south of the 5th DG Building with discharge available to be routed to the ERCW FLEX (or B.5.b) hose connections at the 5th DG Building. Hoses will remain isolated and pumps out of service until required and flood water level is sufficient for pump suction.

14. Stage and align the HP FLEX Pumps (AB elevation 692) with suction hoses routed from the RWST FLEX connections on AB elevation 692 and discharge hoses routed to the Safety Injection Pump Discharge Header FLEX connection [B Train (primary) or A Train (secondary), AB elevation 692]. Complete final valve alignment and operate these pumps as required to maintain RCS pressurizer level.

15. Stage and align the IP FLEX Pumps (AB elevation 737) with suction hoses routed from the AB elevation 737 ERCW FLEX connections and discharge hoses routed to FLEX connections upstream of the TDAFWP LCVs (primary) (SMSVV elevation 729) or MDAFWP LCVs (alternate) (AB elevation 737). Complete final valve alignment and operate these pumps as required to ensure continuous cooling water supply to the SGs.

16. Deploy hoses and spray nozzles as a contingency for SFP makeup. Hoses can be routed to supply makeup from an AB elevation 757 ERCW - CCS Spool Piece FLEX connection (next to the CCS Surge Tanks) to the SFP area or from an AB elevation 737 FLEX connection to the demineralized water makeup header FLEX connection on AB elevation 737. This ensures makeup capability prior to time when boil off initiates. (Reference 18).

17. Initiate diesel fueled portable FLEX equipment refueling operations within 7 - 8 hours. The 500 gallon

tank on at least one of the FLEX trucks should be filled to support FLEX equipment refueling operations by 8 hours from event initiation. Diesel powered FLEX equipment's onboard fuel supply will require replenishment within 10 hours from start of operation.

18. Once directed by the TSC and RCS inventory has been restored by SIP operation, calculated boration and required mixing completed (required SDM verified) and CLAs isolated to ensure against nitrogen injection into the RCS, reduce pressure to 160 psig per ECA-0.0.

Note: If the Condensate Storage Tanks (CSTs) survive the event they will supply an additional reserve of water per unit to the Auxiliary Feedwater Pumps until they are removed from service due to flood waters approaching grade level.

19. The AFWST will be depleted in approximately 15 hours for dual unit SG makeup, makeup options will need to be evaluated and directed. (Reference 46). Potential sources of clean water makeup are the Demineralized Water Storage Tank (DWST), U1 and U2 Primary Water Storage Tanks (PWSTs) and the Tritiated Water Storage Tank (TWST). If the AFWST is depleted the operating Auxiliary Feedwater System pumps' suction will be realigned to the ERCW headers to extend core cooling. The LP FLEX pumps will be aligned to the ERCW headers to provide a raw water input prior to the AFWST depleting. Available raw water in the ERCW headers (without LP FLEX pumps supply) would deplete in 7 hours Unit 1 and 4.7 hours for Unit 2 (Reference 23).

20. Initiate portable lighting for MCR, Shutdown Board Room and FLEX equipment locations as required. This is not a time constraint. The MCR and Shutdown Board Rooms are provided with battery backup lighting. Portable lighting for FLEX equipment staging locations could be required. Portable lighting will be available for internal and external service, if required.

21. Complete ERCW header alignments to ensure ERCW pressures and flows for long term FLEX needs within 12 hours of the event.

Note: Doors to rooms where systems and/or components are in service or in operation should be blocked open to facilitate natural ventilation (i.e., Vital Battery rooms, TDAFWP rooms, Safety Injection Pump rooms).

22. The Vital Battery Room and Shutdown Board Room heating, ventilation, and air conditioning (HVAC) study determined that ventilation is not required until 24 hours into the ELAP event; at which point it can be monitored periodically, if needed (Reference 14).

23. The Main Control Room HVAC study determined that ventilation is not required until 24 hours into ELAP event; at which point it will be monitored periodically (Reference 14).

24. Venting of the SFP area will need to be evaluated within 24 hours based on the SFP time when boil off occurs (Reference 18).

25. Once flood waters recede below plant grade the mobile water purification units and mobile boration units should be staged and aligned. The water purification units will provide clean water to refill the AFWST and makeup to the mobile boration skids. However, cooling water for SG makeup via the ERCW headers is available to be provided indefinitely, if required.

26. Large fuel truck service will need to be established to support post flood recovery. This is based on the depletion of on-site supplies and supplying larger equipment.

Watts Bar has prepared procedures for each task, has performed procedure verification and validation for the implementing FLEX Support Instructions (FSIs) and has completed the NTTF Recommendation 9.3 Phase 2 Staffing Analysis. (Reference 50) In addition, the potential impact of FLEX response actions on design basis flood mode preparations has been addressed. TVA's River Systems Operation (RSO) will notify the WBN control room if Watts Bar Hydro instantaneous flow rate reaches 170,000 cfs, which approximates the 25 year flood frequency based upon observed historical flow data. This notification will provide for initiation of preparatory FLEX equipment deployment and mitigation strategy implementation. (Reference 44).

<table>
<tr><td colspan="2"></td></tr>
<tr><td>Identify how strategies will be deployed in all modes.

Ref: NEI 12-06 section 13.1.6</td><td>Describe how the strategies will be deployed in all modes.</td></tr>
<tr><td colspan="2">Deployment of FLEX equipment is described for each FLEX function in the subsequent sections below and covers all operating modes. The broad-spectrum deployment strategies do not change for the different operating modes. The deployment strategies from the storage areas to the staging areas are identical and include debris removal, equipment transport, fuel transport, and power sources and requirements. RCS makeup connections are provided for the higher flow rates required during core cooling with SGs unavailable. Each of these strategies and the associated connection points are described in detail in the subsequent sections. The electrical coping strategies are the same for all modes. Figures A3-1 through A3-20 show a visual representation of FLEX equipment deployment strategy and FLEX connection options.</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Provide a milestone schedule. This schedule should include:

• Modifications timeline
  ○ Phase 1 Modifications
  ○ Phase 2 Modifications
  ○ Phase 3 Modifications
• Procedure guidance development complete
  ○ Strategies
  ○ Maintenance
• Storage plan (reasonable protection)
• Staffing analysis completion
• FLEX equipment acquisition timeline
• Training completion for the strategies
• Regional Response Centers operational

Ref: NEI 12-06 Section 13.1</td><td></td></tr>
<tr><td colspan="2">The dates specifically required by the order are obligated or committed dates. Other dates are planned dates subject to change.

See attached milestone schedule Attachment 2.</td></tr>
</table>

Identify how the programmatic controls will be met. **Ref: NEI 12-06 Section 11** **JLD-ISG-2012-01 Section 6.0** **NEI 12-02 Revision 1 Section 4** **JLD-ISG-2012-03**	

Equipment associated with these strategies has been procured as commercial equipment with design, storage, maintenance, testing, and configuration control in accordance with NEI 12-06, Revision 0 Section 11.

The unavailability of equipment and applicable connections that directly perform a FLEX mitigation strategy is managed using plant equipment control guidelines developed in accordance with NEI 12-06, Revision 0, Section 11.5.

The unavailability of Spent Fuel Pool (SFP) level instrumentation to perform their intended function is managed using control guidelines developed in accordance with NEI-12-02, Revision 1, Section 4.3.

FLEX Mitigation Strategy required equipment and applicable electrical and mechanical connections and SFP Level Instrumentation unavailability, tracking, return to availability and contingency planning, if required, are addressed in the following TVA NPG procedures:

- OPDP - 8, Operability Determination Process and Limiting Conditions for Operation Tracking. (Reference 47)
- NPG - SPP - 07.3, Work Activity Risk Management Process. (Reference 48)

Programs and controls established to assure personnel proficiency in the mitigation of beyond-design-basis events and maintaining FLEX and SFP level instrumentation are developed and maintained in accordance with NEI 12-06, Revision 0, Section 11.6 and NEI 12-02, Revision1, Section 4.1.

The FLEX strategies, SFP level instrumentation and their basis are maintained in an overall program document. Existing plant configuration control procedures have been modified to ensure that changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies nor SFP level instrumentation in accordance with NEI 12-06, Revision 0, Section 11.8 and NEI 12-02, Revision1, Section 4. (Reference 37)

<u>Procedure Guidance</u>

The PWROG has generated FLEX Support Guidelines (FSGs) in order to assist utilities with the development of site-specific procedures to cope with an ELAP in a manner compliant with the requirements of NEI 12-06. Watts Bar is a participant in the PWROG project PA-PSC-0965 and has implemented FLEX Support Instructions (FSIs) in a timeline to support the implementation of FLEX for Unit 2 initial licensing (startup) and Unit 1 and Unit 2 licensed operation.

The proposed implementation strategy aligns with the procedure hierarchy described in NEI 12-06 in that actions that maneuver the plant are contained within the typical controlling procedure and the FLEX Support Instructions (FSIs) are implemented as necessary to maintain the key safety functions of Core Cooling, Spent Fuel Cooling and Containment in parallel with the controlling procedure actions. The overall approach is symptom–based, meaning that the controlling procedure actions and FSIs are implemented based upon actual plant conditions. (Reference 52)

Watts Bar will continue participation in PA-PSC-0965 and will update plant procedures to maintain consistency with the PWROG program. The following FSIs have been developed to support WBN's FLEX mitigation strategies:

- 0-FSI-1, Long Term RCS Inventory Control

- 0-FSI-2, Alternate AFW Suction Source
- 0-FSI-3, Alternate Low Pressure Feedwater
- 0-FSI-4, DC Bus Management/Load Shed and 480v FLEX DG Alignment
- 0-FSI-5.01, Initial Assessment and FLEX Equipment Staging
- 0-FSI-5.02, 6900v FLEX DG Startup and Alignment
- 0-FSI-5.03, 6.9KV & 480v Shutdown Board Initial FLEX Alignment
- 0-FSI-5.04, 6900v FLEX DG Plant Equipment Loading
- 0-FSI-5.05, ERCW Alignment for 5000 GPM Portable Diesel Pump (5PDP)
- 0-FSI-6, Alternate CST Makeup
- 0-FSI-7, Loss of Vital Instrumentation or Control Power
- 0-FSI-8, Alternate RCS Boration
- 0-FSI-9, Low Decay Heat Temperature Control
- 0-FSI-10, Passive RCS Injection Isolation
- 0-FSI-11, Alternate SFP Makeup and Cooling
- 0-FSI-12, Alternate Containment Cooling
- 0-FSI-13, Transition from FLEX Support Instructions

Maintenance and Testing

The FLEX mitigation equipment has been initially tested (or other reasonable means used) to verify performance conforms to the limiting FLEX requirements. Additionally, Watts Bar has implemented the maintenance and testing template issued by the Electric Power Research Institute (EPRI). The template was developed to meet the FLEX guidelines established in NEI 12-06 Revision Section 11.5.

The SFP level instrumentation has been initially calibrated and tested to verify performance conforms to the requirements of NEI 12-02, Revision1 Section 4.3 and WBN's SFP design. Additionally, WBN has developed maintenance and testing procedures to satisfy the requirements or NEI 12-02, Revision 1, Section 4.2.

Staffing

The FLEX strategies documented in the event sequence analysis assume:

- On-site staff are at administrative minimum shift staffing levels,
- No independent, concurrent events, and
- All personnel on-site are available to support site response.

Watts Bar has addressed staffing considerations in accordance with Reference 2. (Reference 50).

Configuration Control

Per NEI 12-06 and the Interim Staff Guidance (ISG), the FLEX strategies must be maintained to ensure future plant changes do not adversely impact the FLEX strategies.

Therefore, Watts Bar will maintain the FLEX strategies and basis in an overall program document and has modified existing TVA NPG configuration control procedures to ensure changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures do not adversely impact the approved FLEX strategies. (Reference 37)

Describe training plan	Training plans were developed and presented for plant groups including the emergency response organization (ERO), Fire, Security, Emergency Preparedness (EP), Operations, Engineering and Maintenance. The training plan development was accomplished in accordance with Watts Bar procedures using the Systematic Approach to Training, and has been implemented to ensure that the required Watts Bar staff is trained prior to full implementation of NRC Orders EA-12-049 and EA-12-051.

Describe the Strategic Alliance for FLEX Emergency Response (SAFER)/Regional Response Center (NSRC) plan	The nuclear industry has established two National SAFER Response Centers (NSRCs) to support utilities during beyond design basis events. Each NSRC will hold five sets of equipment, four of which will be able to be fully deployed when requested. The fifth set will have equipment that is in a maintenance cycle. Equipment will be moved from the NSRC to a WBN Staging Area, established by the Strategic Alliance for FLEX Emergency Response (SAFER)/NSRC team and TVA. Staging area B is on the WBN site, north of the Emergency Diesel Generator (EDG) Building. Staging area C is the Rockwood Municipal Airport located 34 driving miles from WBN. Staging area D is the Cleveland Regional Jetport which is 45 driving miles from WBN. Communications will be established between Watts Bar and the SAFER/NSRC team and required equipment moved to the site as needed. First arriving equipment, as established in the 'SAFER Response Plan for Watts Bar Nuclear' (Reference 31), will be delivered to the site within 24 hours from the initial request. Once the equipment arrives onsite WBN will utilize it based on plant conditions and need. Details for activation, delivery and operational capability of the Phase 3 equipment can be found in the 'SAFER Response Plan for Watts Bar Nuclear.' (Reference 31). TVA has established an agreement with the SAFER/NSRC team in accordance with the requirements of Section 12 of Reference 2.
Notes: 1. Maintenance and testing, configuration control, training, and regional response center plans have been developed.	

Maintain Core Cooling & Heat Removal
Determine Baseline coping capability with installed coping[1] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • **AFW** • **Depressurize SG for Makeup** • **Sustained Source of Water** **Ref: JLD-ISG-2012-01 Sections 2 and 3**
PWR Installed Equipment Phase 1
<u>Core Cooling with SGs Available</u> The coping strategy is to remove heat from the RCS by providing cooling water to the four SGs. The plant is assumed to be operating at full power at the start of the event. A station blackout (SBO) occurs to start the scenario and all ac power is assumed to be lost. The TDAFWP will start as designed and provide cooling through the SGs. Initial alignment of the TDAFWP suction is to the AFWST. The AFWST will provide approximately 15 hours of inventory to the suction of the TDAFWPs for each unit before the AFWST is depleted. (Reference 46). If the CSTs survive the event an additional inventory of cooling water would be available (~ 300,000 to 385,000 gallons per unit per CST). When clean water sources are depleted (AFWST and possibly CSTs, if the CSTs survive the initiating event), suction flow to the TDAFWPs can be provided by standing water in the ERCW headers. Standing raw water in the ERCW headers would supply an additional 7 hours for Unit 1 and 4.7 hours for Unit 2. (Reference 23) <u>Core Cooling with SGs Not Available</u> Reactor core cooling and heat removal with SGs not available is provided during Phase 1 by heating up and boiling of the RCS coolant inventory. The lowest allowed level in the RCS, when SGs are not available to provide core cooling, is not more than one foot below the vessel flange during the removal of the reactor vessel head. RCS inventory during Phase 1 may be maintained by gravity feed from the RWST at each unit. The ability of the RWST at each unit to provide a gravity feed to the RCS is limited by the RWST fluid height, line losses through the gravity feed path, and pressure within the RCS. If it is determined that gravity feed is not effective to cool the RCS and prevent fuel damage, Watts Bar has taken actions to proceduralize administrative controls to pre-stage FLEX equipment prior to entering a condition where the SGs cannot provide adequate core cooling. (Reference 38). WBN will follow the guidance contained within the Nuclear Energy Institute (NEI) position paper dated September 18, 2013, entitled “Position Paper: Shutdown/Refueling Modes” (Agency Wide Documents Access and Management Systems (ADAMS) Accession No. ML13273A514, which NRC has endorsed. (Reference 24).
Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* SBO Emergency Operating Instruction (EOI) ECA-0.0 currently addresses implementation of this strategy. The strategies in ECA-0.0 are supported by the appropriate FSIs for this strategy. (Reference 17).

[1] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

<table>
<tr><td>Identify Modifications</td><td>List modifications and describe how they support coping time.

1. AFWST and connections to Unit 1 and Unit 2 Auxiliary Feedwater System. (DCN 60060, DCN 62324 & DCN 61422) - Provides 500,000 gallons of demineralized water from a seismically qualified source.

2. 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871) - Increases vital battery coping capability.

3. Backup control stations provide instrument air/nitrogen supplied control capability for the operator to manipulate the SG Atmospheric Relief Valves (ARVs) and Auxiliary Feedwater (AFW) Level Control Valves (LCVs). These stations are located in the shutdown board rooms above the probable maximum flood (PMF) elevation (elevation 757). (DCN 60996 & EDCR 60749)</td></tr>
<tr><td>Key Reactor Parameters</td><td>1. SG Wide Range Level or Narrow Range Level with AFW Flow indication

2. SG Pressure

3. AFWST Level

RCS instrumentation that is assumed to also be available for this function:

1. Core Exit Thermocouple (CET) Temperature**
2. RCS Hot Leg (HL) Temperature (T_{hot}) if CETs not available
3. RCS Cold Leg (CL) Temperature (T_{cold})*
4. RCS Wide Range Pressure
5. Pressurizer Level
6. Reactor Vessel Level Indicating System (RVLIS) (backup to Pressurizer level) – available for up to 27 hours for limiting flood scenario, at which point pressurizer level is available again.
7. Neutron Flux

Watts Bar relies on existing installed 125v DC Vital Batteries to power key instrumentation and emergency lighting. A battery coping calculation determined that the battery coping time is 8 hours. (Reference 30).

*This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for Tcold is SG pressure when natural circulation is occurring. This substitution is allowed by guidance provided in Reference 16.

**This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16.

Watts Bar has developed procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06. (Reference 32)</td></tr>
<tr><td colspan="2">Notes:

1. Core cooling strategies are provided for conditions where SGs are available or where SGs are not available but a sufficient RCS vent can be established to support core cooling. This assumption is per the guidance of NEI 12-06 FAQ 2012-19. Other configurations are not considered as these occur at short durations that are exempted per NEI-12-06 Table D.</td></tr>
</table>

Maintain Core Cooling & Heat Removal
PWR Portable Equipment Phase 2

Provide a general description of the coping strategies using on-site portable equipment including station modifications that are proposed to maintain core cooling. Identify methods and strategy (ies) utilized to achieve this coping time.

Core Cooling with SGs Available

Transition to Phase 2 is required before the Turbine Driven Auxiliary Feedwater Pumps suction sources are depleted. The AFWST contains approximately 15 hours of inventory for dual unit operations. (Reference 46) When clean water sources are depleted (AFWST and possibly CSTs, if the CSTs survive the initiating event), suction flow to the TDAFWPs can be provided by standing water in the ERCW headers. Standing raw water in the ERCW headers would supply an additional 7 hours for Unit 1 and 4.7 hours for Unit 2. (Reference 23).

If the Condensate Storage Tanks (CSTs) survive the initiating event they would provide additional clean water reserve (~ 300,000 to 385,000 gallons per unit per CST) to the TDAFWP's that would be supplying makeup water to the SGs. Surviving, non-seismic, clean water tanks can also be used to provide makeup to the AFWST using diesel driven deployed transfer pumps, hoses and installed FLEX connections.

To provide an unlimited supply of water for core cooling during Phase 2, LP FLEX Pumps will be staged at the IPS and take suction from the intake channel and discharge to 4 ERCW FLEX connections inside the IPS. They will be used to pressurize the ERCW headers which can then be used for direct supply to the TDAFWP suction, if required. An alternate or additional raw water source could come from the Condenser Circulating Water (CCW) Cooling Tower basin supplying suction to a deployed LP FLEX Pump (Dominator) with its discharge routed to ERCW FLEX (or B.5.b) connections located inside the 5th DG Building.

OPTIONS AVAILABLE - NON-FLOOD EVENT:

The Prime Source for Steam Generator (SG) Makeup at Watts Bar Nuclear Plant (WBN) is the Turbine Driven Auxiliary Feedwater Pump (TDAFWP) taking suction from a demineralized water supplied Auxiliary Feedwater Supply Tank (AFWST) and the CSTs, if the non-seismic CSTs survive the initiating event, or from the ERCW system supplying raw water as the ultimate source (safety related), if required.

Option 1. Once the 6.9KV FLEX DGs are available, the Motor Driven Auxiliary Feedwater Pumps (MDAFWPs) (Train A & B) could be placed in service to relieve a TDAFWP, if required. The suction source would be the same as the TDAFWPs.

Option 2. The diesel driven Intermediate Pressure (IP) FLEX pumps are deployed from the FLEX Equipment Storage Building (FESB) and staged on pads next to the AFWST. Pumps suction would be by hose from the AFWST FLEX connections. The discharge is routed by hose to the TDAFWP discharge header FLEX connection in the South Main Steam Valve Vault (MSVV) elevation 729. Optional discharge is to the MDAFWP discharge header FLEX connections on AB elevation 737. (150gpm at 350psig)

Option 3. Once the 6.9KV FLEX DGs are available, the 480v motor driven IP FLEX Pumps pre-staged on AB elevation 737 could be placed in service, if required. Suction would be raw water by hose from the ERCW FLEX connections located on AB elevation 737. The discharge is routed by hose to the TDAFWP discharge header FLEX connection in the South (MSVV) elevation 729. Optional discharge is to the MDAFWP discharge header FLEX connections on AB elevation 737. (150gpm at 350psig) Power supply and control are from the 480v C & A Vent Boards. See Attachment 3, Figures A3-21, A3-23, A3-24 & A3-29 for primary and optional power supplies to the 480v motor driven IP FLEX Pumps.

Option 4. Once the 6.9KV FLEX DGs are available, the 480v motor driven Mode 5 & 6 IP FLEX Pumps pre-staged on AB elevation 692 could be aligned and placed in service as a backup to a failed or unavailable elevation 737 IP FLEX Pump. Suction would be by hose from an ERCW FLEX connection on AB elevation 737. The discharge is routed by hose to the TDAFWP discharge header FLEX connection on elevation 729 in the South (MSVV). Optional discharge is to the MDAFWP discharge header FLEX connections on AB elevation 737. (150gpm at 350psig) Power supply and control are from the 480v C & A Vent Boards. See

Attachment 3, Figures A3-21, A3-23 & A3-29 for primary and optional power supplies to the 480v motor driven IP FLEX Pumps.

Option 5. Once the SGs are depressurized to less than 150 psig (~ 105 to 115 psig) per procedure, the deployed diesel driven Low Pressure (LP) FLEX Pumps (Triton and Dominators) are capable of supplying raw water to the SGs. For the LP FLEX Pumps staged at the IPS, suction will be supplied from the Triton's floating booster pumps in the intake channel providing positive suction to the LP FLEX Pump (Dominator). The LP FLEX pump's (Dominator) discharge will routed by hoses to the ERCW headers via ERCW FLEX connections inside the IPS. An alternate or additional raw water source can be made available from a LP FLEX Pump (Dominator) staged at the Unit 2 cooling tower basin. Its suction would come from the basin with discharge hoses routed to ERCW FLEX connections (or B.5.b connections) located inside the 5th DG Building. FLEX hoses would be connected to ERCW FLEX connections on AB elevation 737 and routed to supply raw water to the Unit 1 and 2 TDAFWP discharge header FLEX connections located on elevation 729 in the Unit 1 and Unit 2 South MSVV. Optional discharge is to the MDAFWP discharge header FLEX connections located on AB elevation 737. The LP FLEX pumps are rated at 5000gpm at 150psig.

Further RCS and SG depressurization would be per procedure ensuring appropriate shutdown margin (SDM) throughout the evolution and Cold Leg Accumulators (CLAs) isolation prior to reducing Reactor Coolant System (RCS) pressure below 250 psig.

OPTIONS AVAILABLE - FLOOD EVENT:

An ELAP could occur at any time, therefore Watts Bar will pre-stage FLEX Flood Mode equipment based on a 25 year flood warning from TVA's Division of Water Management, River Systems Operations (RSO) Branch. TVA's River Systems Operation's procedure RvM-SOP-10.05.06, "Nuclear Notifications and Flood Warning Procedure," and WBN Operation's AOI-7.01, "Maximum Probable Flood," will be revised to provide the notification and direct the pre-staging of FLEX equipment. This early notification allows for FLEX equipment to be staged without impacting resources that would be required for design basis flood mode operation preparations. (Reference 44).

Scenario 1 - ELAP Occurs Simultaneous with or early during the Stage 1 Flood Warning preparation time frame:

When TVA's RSO branch determines that a major flood producing storm (area average rainfall of six inches above Chattanooga) is developing they activate their River Operations Emergency Operations Center (REOC) and establish a 3 hour communication between REOC and WBN. When WBN receives this higher level notification they activate the plant Operations Control Center (OCC) and begin planning for design basis flood actions to ensure that required staffing is obtained in advance of a potential Stage 1 Flood Warning. Once a Stage 1 Flood Warning is received from TVA's REOC, the site has a minimum of 27 hours prior to flood water reaching plant grade (elevation 729). During this 27 hour period, if not prior to, based on management decision and anticipatory communication from RSO, the units would be removed from service, cooled down and depressurized, borated to the required shutdown margin and aligned for flood mode operations. The prime source of SG makeup during this 27 hour period would be the TDAFWP taking suction from the AFWST and CSTs, if the non-seismic CSTs survived the initiating event. If clean water became unavailable the suction source would be transferred to raw water supplied to the ERCW headers by the diesel driven LP FLEX Pumps. Backup options available for ensuring makeup to the SGs during this 27 hour period would be the same as for the non-flood event.

Once flood waters exceed plant grade the AB, Control Building and Turbine Building will flood as designed and for a Probable Maximum Flood (PMF) to elevation 739.2. This would result in the Safety Injection Pumps and TDAFW Pumps being ~ 47 feet under water (~37 feet if flood waters are at plant grade elevation) and the MDAFW Pumps being ~ 26 feet underwater at the PMF level inside the AB.

Prior to flood waters exceeding plant grade, SG makeup would be transitioned to an option that would not be impacted by flood waters onsite or inside the AB.

The options available if the AB was flooded are:

Option 1. The 480v motor driven IP FLEX Pumps (submersible operation capable) are pre-staged on AB elevation 737. Pump suction source is raw water routed by hose from the ERCW FLEX connections located on AB elevation 737. Pump discharge is routed by hose to the TDAFWP discharge header FLEX connection on elevation 729 in the South MSVV. Optional discharge is to the MDAFWP discharge header FLEX connections on AB elevation 737. Power supply and control are from the 480v C & A Vent Boards. See Attachment 3, Figures A3-21, A3-23, A3-24 & A3-29 for primary and optional power supplies to the 480v motor driven IP FLEX Pumps. (150gpm at 350psig)

Option 2. Once the SGs are depressurized to less than 150 psig (~105 to 115 psig) per procedure AOI-7.01, ‘Maximum Probable Flood’, the diesel driven Low Pressure (LP) FLEX Pumps (Triton and Dominators) are capable of supplying raw water to the SGs. Raw water is supplied from a LP FLEX Pump (Dominator) staged at the Unit 2 cooling tower and taking suction from the basin with its discharge hoses routed to ERCW FLEX connections (or B.5.b connections) located inside the 5th DG Building and/or LP FLEX Pumps (Triton and Dominator) taking suction from flood waters South of the 5th DG Building with pump discharge hoses routed to ERCW FLEX connections (or B.5.b connections) located in the 5th DG Building. A FLEX hose would be connected to an ERCW FLEX connection on AB elevation 737 and routed to the TDAFWP discharge header FLEX connection located on elevation 729 in the South MSVV. Optional discharge is to the MDAFWP discharge header FLEX connections on AB elevation 737. (5000gpm at 150psig)

Scenario 2 - ELAP occurs after the units have been shut down, cooled down and depressurized and borated to a Cold Shutdown-Xenon Free Shutdown Margin condition and aligned for design basis flood mode operation (Stage 1 and Stage 2 flood preparations complete per AOI-7.01, Probable Maximum Flood). Flood waters at or above plant grade:

Note: When an ELAP occurred, SG makeup using raw water supplied by the High Pressure Fire Protection system per design response would be lost.

The options available for this condition are:

Hoses would be previously routed and connected with alignment requiring only valve operation.

Option 1. The 480v motor driven IP FLEX Pumps (submersible operation capable) are pre-staged on AB elevation 737. The pumps suction source is raw water routed by hose from the ERCW FLEX connections located on AB elevation 737. The pumps discharge is routed by hose to the TDAFWP discharge header FLEX connections on elevation 729 in each unit’s South MSVV. Optional discharge is a realignment isolating the failed HPFP system feed and aligning makeup supply from the IP FLEX pump to the MDAFWP discharge header FLEX connections on AB elevation 737. (150gpm at 350psig)

Power supply and control are from the 480v C & A Vent Boards. See Attachment 3, Figures A3-21, A3-23, A3-24 & A3-29 for primary and optional power supplies to the 480v motor driven IP FLEX Pumps.

Option 2. Once the SGs are depressurized to less than 150 psig (~ 105 to 115 psig) per procedure AOI-7.01, ‘Maximum Probable Flood’, the diesel driven Low Pressure (LP) FLEX Pumps (Triton and Dominators) are capable of supplying raw water via the ERCW FLEX connections to the SGs. Raw water is supplied by LP FLEX Pumps (Triton and Dominator) taking suction from flood waters South of the 5th DG Building with pump discharge routed by hoses to ERCW FLEX (or B.5.b) connections located in the 5th DG Building. A FLEX hose would be connected to an ERCW FLEX connection on AB elevation 737 and routed to the TDAFWP discharge header FLEX connection located on elevation 729 in the South MSVV. Optional discharge is a realignment aligning makeup supply to the MDAFWP discharge header FLEX connections on AB elevation 737.

Prior to the flood waters exceeding plant grade a LP FLEX Pump (Dominator) staged at the Unit 2 cooling

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 2	
tower and taking suction from the basin with its discharge hoses routed to ERCW FLEX connections (or B.5.b connections) located inside the 5th Diesel Generator (DG) Building would be available to supply raw water to the ERCW headers. (5000gpm at 150psig) Given the plant structures, system and component (SSC) knowledge and emergency response equipment available onsite, near site or from TVA, INPO or NSRC resources, site Operations, Maintenance and Engineering staff will develop additional options and capabilities for providing a makeup source to the SGs. The diesel driven IP FLEX Pumps are stored in and will be deployed from the FESB. The 480v motor driven IP FLEX Pumps are pre-staged on AB elevation 737 inside the AB Supply Fan Rooms, the 480v motor driven Mode 5 & 6 IP FLEX Pumps are pre-staged on AB elevation 692 inside the positive displacement (PD) pump rooms. Note that the unit 1 and unit 2 PD pumps located in the rooms are abandoned equipment. Power supply and control for the IP FLEX Pumps are from the 480v C & A Vent Boards. See Attachment 3, Figures A3-21, A3-23, A3-24 & A3-29 for primary and optional power supplies to the 480v motor driven IP FLEX Pumps. The deployment paths, staging locations and power supply information for the core cooling and heat removal IP FLEX pumps and associated equipment are provided in Attachment 3. For non-flood conditions, Watts Bar will gradually transition to a long term core cooling strategy. This will include the use of the LP FLEX pumps on-site to provide a source of cooling water flow to the component cooling system (CCS) heat exchangers. The 6.9 KV FLEX DGs could be used to repower components such as the Auxiliary Air Compressors, MDAFWPs, CCSPs, select ventilation equipment and other components as need and load capability allows. <u>Core Cooling with SGs Not Available</u> During Cold Shutdown or Refueling Modes, there are many variables that could impact the ability to provide makeup to the RCS and cool the core. With SGs unavailable core cooling is maintained through heat removal from the RCS via coolant boil off. Prior to loss of gravity feed from the RWST, the 480v motor driven Mode 5 & 6 IP FLEX pump must be aligned to take suction from the RWST or another acceptable alternate coolant source and deliver the coolant to the RCS. With SGs unavailable the transition to Phase 2 strategies will be required as inventory is lost from the RCS. Reactor core cooling and heat removal will be provided by using the Mode 5 & 6 IP FLEX pump located on AB elevation 692 to inject water into the RCS via the Safety Injection System FLEX connections. (150gpm at 350psig) Power supply and control are from the 480v C & A Vent Boards. See Attachment 3, Figures A3-21, A3-23 & A3-29 for primary and optional power supplies. The connections utilized for RCS Inventory Control/Long-Term Subcriticality will be utilized for the reactor core cooling and heat removal with steam generators not available strategies (Modes 5 and 6). These connections are described in the RCS inventory control section. In addition, a flushing flow of 123 gpm at atmospheric conditions is required at 31 hours in order to preclude the RCS fluid from the incipient boric acid precipitation point. (Reference 20) WBN will follow the guidance contained within the Nuclear Energy Institute (NEI) position paper dated September 18, 2013, entitled “Position Paper: Shutdown/Refueling Modes” (Agency Wide Documents Access and Management Systems (ADAMS) Accession No. ML13273A514 which NRC has endorsed. (Reference 24)	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Procedures and guidance to support deployment and implementation, including interfaces to Emergency Operating Instructions (EOIs), special event procedures, Abnormal Operating Instructions (AOIs), and System

<table>
<tr><th colspan="2">Maintain Core Cooling & Heat Removal</th></tr>
<tr><th colspan="2">PWR Portable Equipment Phase 2</th></tr>
<tr><td></td><td>Operating Instructions (SOIs), have been developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance and Watts Bar’s strategy aligns with the generic guidance and has considered the Nuclear Steam Supply System (NSSS) specific guidance.</td></tr>
<tr><td>Identify Modifications</td><td>List modifications necessary for Phase 2

1. Backup control stations provide instrument air/nitrogen supplied control capability for the operator to manipulate the SG Atmospheric Relief Valves (ARVs) and Auxiliary Feedwater (AFW) Level Control Valves (LCVs). These stations are located in the shutdown board rooms above the probable maximum flood (PMF) elevation (elevation 757). (DCN 60996 & EDCR 60749).

2. FLEX connections have been provided on the ERCW headers on Auxiliary Building elevation 737 for supplying water to the elevation 737 IP FLEX pumps. (DCN 60684).

3. The primary FLEX connection point has been provided for SG cooling and is located upstream of the SG LCVs on the TDAFWP discharge line. (DCN 60683, DCN 61784 & EDCR 60751).

4. The secondary FLEX connection points have been provided for SG cooling and are located upstream of the SG LCVs in both the Train A and Train B MDAFWP discharge piping. A FLEX connection to both trains is needed to ensure feed to all four SGs. (DCN 60683, DCN 61784 & EDCR 60751).

5. Auxiliary Feedwater Supply Tank (AFWST). (DCN 60060 & DCN 62324).

6. Connections to provide suction capability for Unit 1 AFWPs from the AFWST are complete. (DCN 60060 & DCN 61422).

7. FLEX connections have been provided on the ERCW headers in the IPS for the LP FLEX Pumps to pressurize the ERCW headers during non-flood and flood conditions. (DCN 60684).

8. FLEX connections have been provided on the ERCW headers in the 5th Diesel Generator Building for the LP FLEX Pumps to pressurize the ERCW headers during flood conditions. (DCN 60684).

9. FLEX connections have been provided on the Tritiated Water Storage Tank (TWST), Primary Water Storage Tanks (PWSTs), and Demineralized Water Storage Tank (DWST) to facilitate transfer of water to the AFWST. (DCN 60683, DCN 59397, DCN 60684, DCN 61784 & EDCR 60993).

10. Pre-staged submersible 480v AC HP & IP (Non-Flood, Flood & Mode 5 & 6) FLEX Pumps and provided power. (DCN 63030).

11. FLEX connections have been provided on the Safety Injection Pumps discharge headers for HP FLEX Pumps RCS makeup. (DCN 60683 & EDCR 60750).

12. RWST FLEX connections have been provided for HP FLEX pumps or Mode 5 & 6 IP FLEX Pumps suction source. (DCN 60683 & DCN 61784).</td></tr>
</table>

<table>
<tr><th colspan="2">Maintain Core Cooling & Heat Removal</th></tr>
<tr><th colspan="2">PWR Portable Equipment Phase 2</th></tr>
<tr><td></td><td>13. BAT FLEX connection has been provided for an alternate HP FLEX Pump suction supply. (DCN 60684).

14. FLEX Equipment Storage Building (FESB). (DCN 59084).

15. 225kva DGs (480v FLEX DGs). (DCN 59675).

16. 3 MWe DGs (6.9KV FLEX DGs). (DCN 60853).

17. 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871).

18. Miscellaneous - Installed storage boxes in the AB, IPS and 5th DG Building for hoses, fittings, tools required for implementation. Installed concrete pads and reinforced roads where required for FLEX equipment deployment. (DCN 62889).</td></tr>
<tr><td>Key Reactor Parameters</td><td>List instrumentation credited or recovered for this coping evaluation.

1. SG Wide Range Level or Narrow Range Level with AFW Flow indication

2. SG Pressure

3. AFWST Level

RCS instrumentation that is assumed to also be available for this function:

1. CET Temperature**
2. RCS HL Temperature (T_{hot}) if CETs not available
3. RCS CL Temperature (T_{cold})*
4. RCS Wide Range Pressure
5. Pressurizer Level
6. RVLIS (backup to Pressurizer level) – available for up to 27 hours for limiting flood scenario, at which point pressurizer level is available again.
7. Neutron Flux

For all instruments listed above the normal power source and the long term power source is the 125v DC Vital Battery.

*This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for Tcold is SG pressure when natural circulation is occurring. This substitution is allowed by guidance provided in Reference 16.

**This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16.

Watts Bar has developed procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06. (Reference 32)</td></tr>
</table>

Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The FLEX 6.9KV distribution systems have been analyzed to survive 2X SSE HCLPF. The distribution from the FESB to the EDG Building is housed in robust structures and is missile protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is appropriately protected or located within a Class I structure. The 480v FLEX DGs are pre-staged on the roof of the Auxiliary Building. A protection structure has been built around the DGs, which is designed to the same Seismic Category I requirements as the Auxiliary Building. Seismic input for the design corresponds to the appropriate seismic accelerations at the roof of the Auxiliary Building. This design provides a seismic protection of 2xSSE HCLPF. Portable equipment required to implement this FLEX strategy will be stored/staged/pre-staged in the FESB, AB, IPS and 5th DG Building which are designed for seismic loading in excess of the minimum requirements of the American Society of Civil Engineers (ASCE) 7-10.
Flooding	The 6.9KV FLEX DGs are pre-staged inside the FESB which is located above the PMF elevation. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected, and, from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system, it is designed to withstand PMF waters, is appropriately protected or located within a class I structure. The EDG Building is located above the PMF flood level. The 480v FLEX DGs are pre-staged on the roof of the AB, which is sited in a suitable location that is above the PMF and as such is not susceptible to flooding from any source. Portable and pre-staged equipment required to implement this FLEX strategy will be maintained in the FESB, AB, IPS and 5th DG Building in suitable locations functionally above the Probable Maximum Flood (PMF) level or pre-flood access and distribution or will be capable of submersible operation.
Severe Storms with High Winds	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected, and, from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system, it is appropriately protected or located within a class I structure. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, which is sited in a suitable location that is protected from NRC region 1 tornado, missiles, and velocities as defined in Nuclear Regulatory Commission (NRC) Regulatory Guide 1.76, Revision 1. Portable equipment required to implement this FLEX strategy will be

	maintained in the FESB, AB, IPS and 5th DG Building which are designed to meet or exceed the licensing basis high wind hazard for Watts Bar.
Snow, Ice, and Extreme Cold	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The FESB is provided with a standalone HVAC system to maintain the internal environment between 50 and 100°F up to the point of ELAP. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, and has been evaluated for snow, ice and extreme cold temperature effects and heating has been provided as required to assure no adverse effects on the FLEX equipment. The FESB has been designed to address snow, ice and extreme cold temperature effects and heating will be provided, as required, to assure no adverse effects on the FLEX equipment stage/stored . Equipment stored or staged in the AB, IPS or 5th DG Building are protected from these extremes.
High Temperatures	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The FESB is provided with a standalone HVAC system to maintain the internal environment between 50 and 100°F up to the point of ELAP. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, and has been evaluated for high temperature effects and ventilation is provided as required to assure no adverse effects. The FESB will be evaluated for high temperature effects and ventilation will be provided as required to assure no adverse effects on the FLEX equipment. Equipment stored or staged in the AB, IPS or 5th DG Building are protected from high temperature extremes.

Deployment Conceptual Design

The figures provided in Attachment 3 show the deployment paths from each of the storage locations to the staging locations.

Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
<u>SGs Available</u> The primary connection for the IP FLEX pumps discharge hoses are located in the South Main Steam Valve Vault (MSVV) elevation 729' upstream of the LCVs on the TDAFWP discharge piping. For this alignment during non-flood conditions, suction to the diesel driven IP FLEX Pumps will	<u>Primary connection modifications:</u> • A tee has been added to the TDAFWP discharge line. • An isolation valve has been added to the main line upstream of connection. • An isolation valve has been added to the new branch. • Storz cap/adapter has been added to new branch.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The primary connection is located inside the South Main Steam Valve Vault (MSVV). The MSVV is a safety related structure and is protected from all external hazards except flooding. For flood conditions, procedures will ensure

be taken from the AFWST or for the elevation 737 480v motor driven IP FLEX Pumps suction would come from the elevation 737 ERCW FLEX connections. During flood conditions, suction will be taken from the elevation 737 ERCW header FLEX connections. Discharge of the IP FLEX Pumps will be to the connection points shown in Attachment 3, Figure A3-1. The proposed hose routing for the primary connection and the associated equipment staging area can be found in Attachment 3, Figures A3-3 and A3-4. ERCW connections can be found in Attachment 3, Figures A3-17 and A3-18. Power supply and control are from the 480v C & A Vent Boards. See Attachment 3, Figures A3-21, A3-23, A3-24 & A3-29 for primary and optional power supplies to the 480v motor driven IP FLEX Pumps.	AFWST modifications: Storz hose connections have been provided with the new AFWST. ERCW modifications: For non-flood conditions, one set of LP FLEX pumps will be staged next to the IPS. The existing ERCW piping in the IPS has been modified to add isolation valves with hose connections to allow the ERCW headers to be supplied with raw water by the LP FLEX Pumps. An alternate or additional raw water source could come from the Condenser Circulating Water (CCW) cooling tower basin supplying a suction source to a Dominator LP FLEX Pump with its discharge routed to ERCW FLEX connections (or B.5.b connections) at the 5th DG Building. For flood conditions, a Dominator LP FLEX Pump taking suction from a CCW Cooling Tower Basin with its discharge routed to the ERCW FLEX (or B.5.b) connections inside the 5th DG Building would be staged and aligned. A second complete set of LP FLEX pumps (Dominator and Triton) will be staged next to the 5th DG Building. The existing ERCW piping inside the 5th DG Building provides FLEX and B.5.b connections (isolation valves with hose connections) to allow the ERCW headers to be supplied with raw water from the LP FLEX Pumps. To supply water to the suction of the 480v motor driven AB elevation 737 IP FLEX pumps or, if required, the AB elevation 692 Mode 5 & 6 IP FLEX Pumps, existing ERCW header cleanout ports in the AB on elevation 737 will be utilized. The cleanout ports have been modified to add Storz hose connections.	that hoses are connected before flood levels reach the connection. The connections to the AFWST and ERCW are seismically qualified and missile protected. For connections required during flood conditions, procedures ensure that hoses are connected before flood levels reach the connection. Connections to other tanks are not protected since the connections are to non-protected tanks and would only be available if the tank survives the event. These connections are used to provide additional capability above the minimum FLEX requirements.

	<u>Other tank modifications</u> Storz hose connections with individual isolation valves have been added to the TWST, PWSTs, and DWST for water transfer pump capability to supply clean makeup water to the AFWST.	
<u>SGs Available</u> The secondary connection has been located in the AB on Elevation 737 upstream of the LCVs on the MDAFWP discharge piping. For this alignment, suction will be taken from the AFWST (for the diesel driven IP FLEX Pump) or ERCW headers (for the 480v motor driven FLEX Pumps) and discharged through the IP FLEX Pumps to the connection points shown in Attachment 3, Figure A3-2. The proposed hose routing for the secondary connection and the associated equipment staging area can be found in Attachment 3, Figure A3-3 and Figure A3-5. ERCW connections can be found in Attachment 3, Figures A3-17 and A3-18. Power supply and control for the 480v motor driven IP FLEX Pumps are from the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-23, A3-24 & A3-29.	<u>Secondary connection modifications:</u> • Hard piping has been installed between the high pressure fire protection (HPFP) Train A and Train B flood mode supply piping and the MDAFWP Train A and Train B piping which replaced the existing removable spool pieces. • A tee has been added to this piping. • Additional isolation valves have been added to either side of the new tees. • Additional isolation valves have been added on the new branches. • Storz connections, caps and adapters have been added to these new branches. <u>AFWST, ERCW, and other tank modifications:</u> Same as primary.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The secondary connections are located inside the AB. The AB is a safety related structure and is protected from all external hazards except flooding. For flood conditions, procedures ensure that hoses are connected before flood levels reach the connection. The connections to the AFWST and ERCW are seismically qualified and missile protected. For connections required during flood conditions, procedures ensure that hoses are connected before flood levels reach the connection. Connections to non-seismic tanks are not protected and would only be available if the tank survives the event. These connections are used to provide additional capability above the minimum FLEX requirements.
<u>Steam Generators Not Available</u> When SGs are not available, suction will be taken from the RWST FLEX connections (AB elevation 692) through the Modes 5 & 6 IP FLEX Pumps staged on AB elevation 692 with pump discharge routed to the primary FLEX connections on the Train B Safety Injection Pumps discharge headers. Attachment 3, Figure A3-11.	<u>Primary Connection Modification</u> • Installed tees or weldolets, • Added isolation valves • Added a hose adapters <u>RWST Modifications:</u> • Installed pipe taps on RWST supply lines to the Refueling Water Purification Pumps on AB elevation 692. • Added isolation valves on these connection locations.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The primary connections for the Safety Injection Pump (SIP) Train B discharge header and RWST are located inside the AB. The AB is a safety related structure and is protected from all external hazards except flooding. For flood conditions, procedures ensure that hoses are connected before flood

Power supply to the Mode 5 & 6 IP FLEX Pumps are from the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-23 & A3-29.	• Added Storz adapters with caps on branches. <u>Safety Injection Pump Discharge Header Modifications</u> FLEX connections on the Safety Injection Pumps discharge Headers for HP FLEX Pumps RCS makeup are located on AB elevation 692.	levels reach the connection. The RWST connections are located inside the AB on elevation 692. For connections required during flood conditions, procedures ensure that hoses are connected before flood levels reach the connection.
<u>SGs Not Available</u> When SGs are not available, suction will be taken from the RWST FLEX connections (AB elevation 692) through the Mode 5 & 6 IP FLEX Pumps pre-staged on AB elevation 692 with pump discharge routed to the secondary FLEX connections on the Train A Safety Injection Pumps discharge headers. Attachment 3, Figure A3- 11. Power supply for the 480v motor driven IP FLEX Pumps is from the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-23 & A3-29.	The secondary Mode 5 & 6 IP FLEX connection modification for steam generators not available is identical to the primary, except for being located on the Safety Injection Pump (SIP) Train B discharge header. <u>BAT Modification</u> • Installed tees on discharge lines of BAT A on AB elevation 713. • Added an isolation valve on the branch. • Added a Storz adapter with cap on the branch.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The secondary FLEX connections for the Safety Injection Pump (SIP) Train A discharge header and the BAT are located inside the AB. The AB is a safety related structure and is protected from all external hazards except flooding. For flood conditions, procedures ensure that hoses are connected before flood levels reach the connection. The BAT serves as a secondary source and is located inside the AB on elevation 713. For connections required during flood conditions, procedures ensure that hoses are connected before flood levels reach the connection.

Notes:

1. System modifications are described in the “Modifications” section above and are illustrated in Attachment 3.
2. Figures A3-3 through A3-5 in Attachment 3 provides the deployment routes from the staging locations for each IP FLEX pump to the pump suction source and to the primary and secondary connection points on the AFW system.
3. Figures A3-21 through A3-29 provide FLEX power distribution information for 480v Motor Driven FLEX Pumps.
4. Core cooling strategies are provided for conditions where SGs are available or where SGs are not available, but a sufficient RCS vent could be established to support core cooling. This assumption is per the guidance of NEI 12-06 FAQ 2012-19. Other configurations are not considered as these occur at short durations that are exempted per NEI-12-06 Table D.

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 3	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain core cooling. Identify methods and strategy (ies) utilized to achieve this coping time. <u>Core Cooling with SGs Available</u> For Phase 3, Watts Bar will continue the Phase 2 coping strategies with additional assistance provided from offsite equipment/resources. The Strategic Alliance for FLEX Emergency Response (SAFER) was selected by the Nuclear Strategic Issues Advisory Committee (NSIAC) to provide offsite National SAFER Response Centers (NSRCs) for the nuclear industry in the United States. The NSRC provides additional capability and redundancy of equipment and resources until power, water, and coolant injection components or systems are restored or commissioned. There are 2 NSRC sites. One located in Memphis, TN and another in Phoenix, AZ. Once the call is made to the NSRC, they will provide ground and/or air transportation of the equipment to WBN staging areas B, C, or D within 24 hours. Staging area B is the area north of the EDG building. Staging area C is the Rockwood Municipal Airport located 34 driving miles from WBN. Staging area D is the Cleveland Regional Jetport which is 45 driving miles from WBN. Once the equipment is onsite, WBN will utilize it based on plant conditions and if needed to replace or augment operating FLEX Phase 2 equipment. Additional details for NSRC activation and the equipment that will be provided and delivered can be found in the WBN SAFER playbook, "SAFER Response Plan for Watts Bar Nuclear" (Reference 31). <u>Core Cooling with SGs Not Available</u> Reactor core cooling with SGs not available is adequately maintained via the Phase 2 strategy.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to Emergency Operating Instructions (EOIs), special event procedures, Abnormal Operating Instructions (AOIs), and System Operating Instructions (SOIs), have been developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance and Watts Bar's strategy aligns with the generic guidance and considered the NSSS specific guidance. Finally, Watts Bar included in procedure notification of the NSRC to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities. TVA NPG has included in CECC EPIP - 3, Operations Duty Specialist Procedure For Alert, Site Area Emergency or General Emergency notification of the NSRC to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities. (Reference 40).
Identify Modifications	Each of the Phase 3 strategies utilize common connections or adapters where required as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. SG Wide Range Level or Narrow Range Level with AFW Flow indication 2. SG Pressure 3. AFWST Level RCS instrumentation that is assumed to also be available for this function: 1. CET Temperature**

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 3		
	2. RCS HL Temperature (T_{hot}) if CETs not available 3. RCS CL Temperature (T_{cold})* 4. RCS Wide Range Pressure 5. Pressurizer Level 6. RVLIS (backup to Pressurizer level) – available for up to 27 hours for limiting flood scenario, at which point pressurizer level is available again. 7. Neutron Flux For all instruments listed above the normal power source and the long-term power source is the 125v DC Vital Battery. *This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for Tcold is SG pressure when natural circulation is occurring. This substitution is allowed by guidance provided in Reference 16. **This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Watts Bar has developed procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06. (Reference 32).	
Deployment Conceptual Design		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
A mobile water purification system will enable water from the Tennessee River or other raw water source to be purified. This unit would process the water source and discharge improved quality water to the AFWST.	Each of the Phase 3 strategies will utilize common connections or adapters as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The mobile water purification system will be supplied raw water from the Tennessee River or other raw water source. The discharge connections will be identical to the ones used for water transfer noted in Phase 2. The protection of those connection points is described in the section for Phase 2.
Notes: 1. Core cooling strategies are provided for conditions where Steam Generators are available or where Steam Generators are not available, but a sufficient RCS vent can be established to support core cooling. This assumption is per the guidance of NEI 12-06 FAQ 2012-19. Other configurations are not considered as these occur at short durations that are exempted per NEI-12-06 Table D.		

Maintain RCS Inventory Control	
PWR Installed Equipment Phase 1:	
Determine Baseline coping capability with installed coping[2] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • RCS makeup required (standard design RCP seals) • All Plants Provide Means to Provide Borated RCS Makeup	
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain RCS inventory control. This section discusses RCS inventory control and subcriticality issues for conditions where SGs are available. RCS inventory control and subcriticality issues for conditions where SGs are not available are addressed in the reactor core cooling and heat removal section of this report. Following the declaration of an ELAP, a plant depressurization and cooldown will be initiated at approximately 1 hour of ELAP event. Natural circulation is maintained by ensuring adequate RCS inventory. Watts Bar Unit 1 and Unit 2 have standard Westinghouse RCP seals and given an ELAP event at rated RCS pressure a potential RCP seal leakage rate of 20.3 gpm exists. At a cold leg pressure of 1485 psig a potential leakage rate of 23.6 gpm per RCP is possible. (Reference 35 & Reference 55) Utilizing WCAP-17601 methodology (Reference 8), References 20 and 49 summarize the limiting plant-specific scenarios for RCS inventory control, shutdown margin, and Mode 5/Mode 6 boric acid precipitation control with respect to the guidelines set forth in NEI 12-06 (Reference 2). RCS inventory is a significant concern for the ELAP scenario due to the RCP seal design. Timely RCS cooldown and depressurization at 75 to 100°F per hour to ~ 300 psig SG pressure should result in an RCS pressure of ~305 psig and ~ 425°F Tavg. Holding RCS pressure to greater than 250 psig ensures no nitrogen injection into the RCS from Cold Leg Accumulators. RCS makeup is required to compensate for the RCP seal leakage and from shrinkage due to cooldown. For Phase 1 RCS makeup is provided from the Safety Injection System Cold Leg Accumulators. RCP seal leakage would be greatly reduced due to the reduction in RCS pressure.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* SBO EOI ECA-0.0 addresses procedural guidance required for maintaining RCS inventory during Phase 1. (Reference 17) Procedures and guidance to support implementation of a boration strategy, including interfaces to EOIs, special event procedures, AOIs, and SOIs, have been developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance and Watts Bar's strategy aligns with the generic guidance and considered the NSSS specific guidance.
Identify Modifications	*List modifications* 1. 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871). 2. Backup control stations provide instrument air/nitrogen supplied control

[2] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain RCS Inventory Control	
PWR Installed Equipment Phase 1:	
	capability for the operator to manipulate the SG Atmospheric Relief Valves (ARVs) and Auxiliary Feedwater (AFW) Level Control Valves (LCVs). These stations are located in the shutdown board rooms above the probable maximum flood (PMF) elevation (elevation 757). (DCN 60996 & EDCR 60749). 3. AFWST and connections to the Auxiliary Feedwater Systems. (DCN 60060, DCN 62324 & DCN 61422).
Key Reactor Parameters	*List instrumentation credited for this coping evaluation.* 1. CET Temperature** 2. RCS HL Temperature (T_{hot}) if CETs not available 3. RCS CL Temperature (T_{cold})* 4. RCS Wide Range Pressure 5. Pressurizer Level 6. RVLIS (backup to pressurizer level) – available for up to 27 hours for limiting flood scenario, at which point pressurizer level is available again. 7. Neutron Flux Watts Bar relies on existing installed 125v DC Vital Batteries to power key instrumentation and emergency lighting. A battery coping calculation determined that the battery coping time is 8 hours. (Reference 30). *This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for Tcold is SG pressure when natural circulation is occurring. This substitution is allowed by guidance provided in Reference 16. **This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Watts Bar has developed procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06. (Reference 32)
Notes: None	

Maintain RCS Inventory Control
PWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain RCS inventory control. Identify methods (borated high pressure RCS makeup) and strategy (ies) utilized to achieve this coping time.

This section discusses RCS inventory control and subcriticality issues for conditions where SGs are available. RCS inventory control and subcriticality issues for conditions where SGs are not available are addressed in the reactor core cooling and heat removal section of this report.

Following the declaration of an ELAP, a plant cooldown will be initiated at approximately 1 hour of ELAP event. Natural circulation is maintained by ensuring adequate RCS inventory.

Watts Bar Unit 1 and Unit 2 have standard Westinghouse RCP seals and given an ELAP event at rated RCS pressure a potential RCP seal leakage rate of 20.3 gpm exists. At a cold leg pressure of 1485 psig a potential leakage rate of 23.6 gpm per RCP is possible. (Reference 35 & Reference 55)

Utilizing WCAP-17601 methodology (Reference 8) and Westinghouse Calculation Note, CN-SEE-II-13-26, (Reference 20) summarizes the limiting plant-specific scenarios for RCS inventory control, shutdown margin, and Mode 5/Mode 6 boric acid precipitation control with respect to the guidelines set forth in NEI 12-06 (Reference 2).

OPTIONS AVAILABLE - NON-FLOOD EVENT:

Following WBN's Mitigation Strategy, within one hour of the initiating event the units will begin cooldown and depressurization of the RCS to mitigate a potential 20.3 gpm per reactor coolant pump (RCP) leakage from the standard RCP seals at rated RCS pressure. At a cold leg pressure of 1485 psig a potential leakage rate of 23.6 gpm per RCP is possible. (Reference 35 & Reference 55) Timely RCS cooldown and depressurization at 75 to 100°F per hour to ~ 300 psig SG pressure should result in an RCS pressure of ~320 psig and ~ 450°F Tavg. The first source of RCS makeup is from the Safety Injection System Cold Leg Accumulators (CLAs). As RCS pressure is reduced below the CLA tank pressure this passive safety system will start injecting borated water of 3000-3150 ppm boron concentration into the RCS. This will help compensate for the inventory loss from the RCP seal leakage and RCS shrinkage due to the cooldown. RCS pressure will be held above 250 psig to minimize the possibility of injecting nitrogen from the CLAs into the RCS. RCS cooldown and depressurization should be stabilized within 4 hours of the initiating event. The 6.9KV FLEX Diesel Generators (DGs) will have repowered the 6.9KV Shutdown Boards at approximately 5 hours allowing operation of the Component Cooling System pumps to support the operation of the Safety Injection Pumps (SIPs). Operation of a SIP in its normal alignment will take suction from the RWST containing ~ 370,000 gallons of demineralized water with a 3100 - 3300 ppm boron concentration and inject into all 4 RCS cold legs. The SIP operation will provide boration and restore RCS inventory and maintain pressurizer level until the HP FLEX Pump assumed this task. RCP seal leakage would be greatly reduced to ~ 8 to 0.7 gpm per RCP from the reduction in RCS pressure. Approximately 8.5 hours after the initiating event the pre-staged 480v motor driven High Pressure (HP) FLEX pumps will be available for service. These pumps would be aligned with a suction hose from RWST FLEX connections located on Auxiliary Building elevation 692 and a discharge hose routed to a SIP discharge header FLEX connection on AB elevation 692. An optional suction source is available from a FLEX connection on the Boric Acid Tanks (BAT) (~6900 ppm boron concentration) located on AB elevation 713. Once RCS pressure is reduced, RCP seal leak rate is concurrently reduced and RCS inventory is recovered, the HP FLEX Pump is capable of maintaining RCS inventory. (40gpm at 600psig) The HP FLEX Pumps are fed from and operated from the 480v C & A Vent Boards 1A2-A and 2B2-B. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-22, A3-23, A3-25, A3-26, A3-27 & A3-28. The spare HP FLEX Pump can also be powered via disconnect switch operation from 480v FLEX DG 'A'.

Option 1. A spare pre-staged HP FLEX Pump is located on AB elevation 692 that can be aligned to replace either unit's pre-staged HP FLEX Pump, if required. This spare HP FLEX Pump can be powered from either its

Maintain RCS Inventory Control
PWR Portable Equipment Phase 2:

normal feed C & A Vent Board 2B2-B or via disconnect switch operation from 480v FLEX DG A. (40gpm at 600psig) Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-22, A3-23, A3-25, A3-26, A3-27 & A3-28.

Option 2. The diesel driven Intermediate Pressure (IP) FLEX pumps are deployed from the FLEX Equipment Storage Building and normally staged on pads next to the AFWST and aligned as a backup option to the TDAFWP for SG makeup. If required, this pump could be staged and aligned to provide RCS makeup. This option would required a reduction in RCS pressure to ensure adequate injection from the diesel driven IP FLEX Pump. A suction hose would be routed from the RWST FLEX connection located on AB elevation 692 and a discharge hose routed to the SIP discharge header FLEX connection located on AB elevation 692. (150gpm at 350psig)

OPTIONS AVAILABLE - FLOOD EVENT:

An ELAP could occur at any time, therefore Watts Bar will pre-stage FLEX Flood Mode equipment based on a 25 year flood warning from TVA's Division of Water Management, River Systems Operations (RSO) Branch. TVA's River Systems Operation's procedure RvM-SOP-10.05.06, "Nuclear Notifications and Flood Warning Procedure" and WBN Operation's AOI-7.01, "Maximum Probable Flood," was revised to provide the notification and WBN will direct the pre-staging of FLEX equipment. This early notification allows for FLEX equipment to be staged without impacting resources that would be required for design basis flood mode Stage 1 and Stage 2 Flood Warning preparations. (Reference 44).

Scenario 1 - ELAP occurs simultaneous with or early during the Stage 1 Flood Warning preparation time frame:

When TVA's RSO branch determines that a major flood producing storm (area average rainfall of six inches above Chattanooga) is developing they activate their River Operations Emergency Operations Center (REOC) and establish a 3 hour communication between REOC and WBN. When WBN receives this higher level notification they activate the plant Operations Control Center (OCC) and begin planning for design basis flood actions to ensure that required staffing is obtained in advance of a potential Stage 1 Flood Warning. Once a Stage 1 Flood Warning is received from TVA's REOC the site has a minimum of 27 hours prior to flood water reaching plant grade (elevation 729). During this 27 hour period, if the units were in either of Modes 1 through 4 they would be shutdown, cooled down and depressurized, borated to the required shutdown margin and aligned for flood mode operations.

Assuming the units were in Mode 1 when the ELAP occurred, the initial source of RCS inventory makeup would be the injection of borated water from the CLAs as the units are depressurized. Once the 6.9KV FLEX DGs repowered the 6.9KV Shutdown Boards and the 480v Shutdown Power distribution system the Safety Injection Pumps will recover RCS inventory taking suction from the RWST. The pre-staged 480v motor driven HP FLEX Pumps (submersible operation capable) would be aligned with suction from the RWST via FLEX connections located on AB elevation 692 and discharge to a FLEX connection located on a SIP discharge header and operated to maintain RCS inventory as required. (40gpm at 600psig)

If the suction supply to a HP FLEX Pump was aligned from the AB elevation 713 BAT FLEX connection it would be transferred to the RWST FLEX connection on AB elevation 692 prior to flood waters reaching grade level.

Once flood waters exceed plant grade the AB, Control Building and Turbine Building will flood as designed and for a Probable Maximum Flood (PMF), flood water will reach elevation 739.2.

Prior to flood waters exceeding plant grade power to the SIPs would be secured at the 6.9KV Shutdown Boards to ensure electrical separation from equipment not designed for AB design basis flood water levels.

The option available if the AB flooded is:

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
Note: The suction and discharge hoses to the HP FLEX Pumps would be required to be connected and valves aligned for operation prior to flood waters exceeding plant grade. Note: If the spare pre-staged HP FLEX Pump was required to replace one of the unit's HP FLEX Pumps hose and valve alignments must be completed prior to flood waters exceeding plant grade. Option. The 480v motor driven HP FLEX Pumps (submersible operation capable) pre-staged on AB elevation 692 would be aligned. The HP FLEX Pumps suction source is borated water from the RWST FLEX connections located on AB elevation 692 with the discharge hoses routed to SIP discharge header FLEX connections. (40gpm at 600psig) The ultimate power source for the 480v motor driven HP FLEX Pumps is a 6.9KV FLEX DG through the 480v Shutdown Power distribution network to the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-22, A3-23, A3-25, A3-26, A3-27 & A3-28. **Scenario 2 - ELAP Occurs after the units have been shut down, cooled down and depressurized and borated to a Cold Shutdown-Xenon Free Shutdown Margin condition and aligned for design basis flood mode operation (Stage 1 and Stage 2 flood preparations complete per AOI-7.01, Probable Maximum Flood). Flood waters at or above plant grade:** The option available for this condition is: Note: If the spare pre-staged HP FLEX Pump was required to replace one of the unit's HP FLEX Pumps, hose and valve alignments must be completed prior to flood waters exceeding plant grade. Hoses would be previously routed and connected with alignment completed requiring only operation of the HP FLEX Pumps. Option. The 480v motor driven HP FLEX Pumps (submersible operation capable) pre-staged on AB elevation 692. The suction source is RWST borated water from the RWST FLEX connections located on AB elevation 692 and discharge hoses routed to SIP discharge header FLEX connections located in the SIP rooms on AB elevation 692. (40gpm at 600psig) The ultimate power source for the 480v motor driven IP FLEX is a 6.9KV FLEX DG through the 480v Shutdown Power distribution network to the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-22, A3-23, A3-25, A3-26, A3-27 & A3-28. Given the plant structures, system and component (SSC) knowledge and emergency response equipment available onsite or from TVA, INPO or NSRC resources, site Operations, Maintenance and Engineering staff will develop additional options and capabilities for providing a makeup source to the RCS.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs, and SOIs, will be developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considered the NSSS specific guidance.
Identify Modifications	*List modifications necessary for Phase 2* 1. Backup control stations provide instrument air/nitrogen supplied control capability for the operator to manipulate the SG Atmospheric Relief Valves (ARVs) and Auxiliary Feedwater (AFW) Level Control Valves (LCVs). These stations are located in the shutdown board rooms above the probable maximum flood (PMF) elevation (elevation 757). (DCN 60996 & EDCR 60749)

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
	2. FLEX connections have been provided on the ERCW headers in the Auxiliary Building elevation 737 for supplying water to the IP FLEX pump.(DCN 60684) 3. The primary FLEX connection point has been provided for SG cooling and is located upstream of the SG LCVs on the TDAFWP discharge line. (DCN 60683, DCN 61784 & EDCR 60751) 4. The secondary FLEX connection points have been provided for SG cooling and are located upstream of the SG LCVs in both the Train A and Train B MDAFWP discharge piping. A connection to both trains is needed to ensure feed to all four SGs. (DCN 60683, DCN 61784 & EDCR 60751) 5. Auxiliary Feedwater Supply Tank. (DCN 60060 & DCN 62324) 6. FLEX connections to provide suction capability for Unit 1 AFWPs from the AFWST are complete. (DCN 60060 & DCN 61422) 7. FLEX connections have been provided on the ERCW headers in the Intake Pumping Station (IPS) for the LP FLEX Pumps to pressurize the ERCW headers during non-flood and flood conditions. (DCN 60684) 8. FLEX connections have been provided on the ERCW headers in the 5th DG Building for the LP FLEX Pumps to pressurize the ERCW headers during flood conditions. (DCN 60684) 9. FLEX connections have been provided on the Tritiated Water Storage Tank (TWST), Primary Water Storage Tanks (PWSTs), and Demineralized Water Storage Tank to transfer water to the AFWST. (DCN 60684, DCN 60683, DCN 61784 & EDCR 60993)10. FLEX connections have been provided on the Safety Injection Pumps discharge headers for HP FLEX Pumps RCS makeup. (DCN 60683 & EDCR 60750) 11. Pre-staged submersible 480v AC HP & IP (Flood & Mode 5 & 6) FLEX Pumps and provided power. (DCN 63030) 12. RWST FLEX connections have been provided for HP FLEX pumps or Mode 5 & 6 IP FLEX Pumps suction source. (DCN 60683 & DCN 61784) 13. BAT FLEX connection has been provided for an alternate HP FLEX Pump suction supply. (DCN 60684) 14. FLEX Equipment Storage Building (FESB). (DCN 59084) 15. 225kva DGs (480v FLEX DGs). (DCN 59675) 16. 3 MWe DGs (6.9KV FLEX DGs) (DCN 60853) 17. 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871) 18. Miscellaneous - Installed storage boxes in the AB, IPS and 5th DG Building for hoses, fittings, tools required for implementation. Installed concrete pads and reinforced roads where required for FLEX equipment deployment. (DCN 62889)

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. CET Temperature** 2. RCS HL Temperature (T_{hot}) if CETs not available 3. RCS CL Temperature (T_{cold})* 4. RCS wide range pressure 5. RCS Passive Injection Level 6. Pressurizer Level 7. RVLIS (backup to Pressurizer level) – available for up to 27 hours for limiting flood scenario, at which point pressurizer level is available again. 8. Neutron Flux For all instruments listed above the normal power source and the long-term power source is the 125v DC Vital Battery. *This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for Tcold is SG pressure when natural circulation is occurring. This substitution is allowed by guidance provided in Reference 16. **This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Watts Bar has developed procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06. (Reference 32)
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The FLEX 6.9KV distribution systems have been analyzed to survive 2XSSE HCLPF. The distribution from the FESB to the EDG Building is housed in robust structures and is missile protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is appropriately protected or located within a Class I structure. The 480v FLEX DGs are pre-staged on the roof of the Auxiliary Building. A protection structure has been built around the DGs, which is designed to the same Seismic Category I requirements as the Auxiliary Building. Seismic input for the design corresponds to the appropriate seismic accelerations at the roof of the Auxiliary Building. This design provides a seismic protection of 2xSSE HCLPF. Portable equipment required to implement this FLEX strategy will be stored/staged/pre-staged in the FESB, AB, IPS and 5th DG Building which are designed for seismic loading in excess of the minimum requirements of

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
	the American Society of Civil Engineers (ASCE) 7-10.
Flooding	The 6.9KV FLEX DGs are pre-staged inside the FESB which is located above the PMF elevation. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is designed to withstand PMF waters, is appropriately protected or located within a class I structure. The EDG Building is located above the PMF flood level. The 480v FLEX DGs are pre-staged on the roof of the AB, which is sited in a suitable location that is above the PMF and as such is not susceptible to flooding from any source. Portable and pre-staged equipment required to implement this FLEX strategy will be maintained in the FESB, AB, IPS and 5th DG Building in suitable locations functionally above the Probable Maximum Flood (PMF) level or are capable of submersible operation. Equipment required for this function will be stored so that it can be deployed prior to any concerns with flooding.
Severe Storms with High Winds	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is appropriately protected or located within a class I structure. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, which is sited in a suitable location that is protected from NRC region 1 tornado, missiles, and velocities as defined in Nuclear Regulatory Commission (NRC) Regulatory Guide 1.76 Revision 1. Portable equipment required to implement this FLEX strategy will be maintained in the FESB, AB, IPS and 5th DG Building which are designed to meet or exceed the licensing basis high wind hazard for Watts Bar.
Snow, Ice, and Extreme Cold	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The FESB is provided with a standalone HVAC system to maintain the internal environment between 50 and 100°F up to the point of ELAP. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, and has been evaluated for snow, ice and extreme cold temperature effects and heating has been provided as required to assure no adverse effects on the FLEX equipment. The FESB has been designed to address snow, ice and extreme cold temperature effects and heating will be provided as required to assure no adverse effects on the FLEX equipment stage/stored there. Equipment stored or staged in the AB, IPS or 5th DG Building are protected from these

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
	extremes.
High Temperatures	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The FESB is provided with a standalone HVAC system to maintain the internal environment between 50 and 100°F up to the point of ELAP. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, and has been evaluated for high temperature effects and ventilation is provided as required to assure no adverse effects. The FESB will be evaluated for high temperature effects and ventilation will be provided as required to assure no adverse effects on the FLEX equipment. Equipment stored or staged in the AB, IPS or 5th DG Building are protected from high temperature extremes.

Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
The primary RCS makeup FLEX connection is located on the SIP Train B discharge line, in the SIP room at elevation 692. For this alignment, suction will be taken from the RWST and discharged through the HP FLEX pumps to the FLEX connection points shown in Attachment 3, Figure A3-6. The proposed hose routing for the primary connection and the associated equipment can be found in Attachment 3, Figures A3-8 through A3-10. The power supply and control for the 480v motor driven HP FLEX Pumps are the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-22, A3-23, A3-25, A3-26, A3-27 & A3-28. During Mode 5 and 6 with SGs	Primary Connection Modification • Installed tees or weldolets, • Added isolation valves • Added hose adapters RWST Modifications: The RWST FLEX connections are located on elevation 692 in the Auxiliary Building. Safety Injection Pum p Discharge Header Modifications The FLEX connections on the SIPs discharge Headers for HP FLEX Pumps RCS makeup are located on AB elevation 692.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The primary FLEX connection and RWST connection are located inside the Auxiliary Building. The AB is a safety related structure and is protected from all external hazards except flooding. The RWST FLEX connections are seismically qualified and missile protected.

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 2:		
unavailable, suction will be taken from the RWST FLEX connections and discharged through the Mode 5 & 6 IP FLEX pumps (pre-staged in AB elevation 692. near the primary connection point). Power supply for the 480v motor driven Mode 5 & 6 IP FLEX Pumps is from the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-23 & A3-29.		
The secondary RCS makeup FLEX connection will be on the SIP Train A discharge line, in the SIP room at elevation 692. For this alignment, suction will be taken from the RWST and discharged through the HP FLEX pumps to the connection points shown in Attachment 3, Figure A3-6. The proposed hose routing for the secondary RCS FLEX connection and the associated equipment can be found in Attachment 3, Figure A3-8. The secondary HP FLEX Pump suction source is the Boric Acid Tanks (BATs) shown on Attachment 3, Figures A3-9 and A3-10. The power supply and control for the 480v motor driven HP FLEX Pumps are the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-22, A3-23, A3-25, A3-26, A3-27 & A3-28. During Mode 5 and 6 with SGs unavailable, suction will be taken from the RWST and discharged through the Mode 5	The secondary FLEX connection modification is identical to the primary, except for being located on SIP Train A discharge. <u>BAT Modification</u> • Installed tee on discharge line of BAT A on AB elevation 713. • Added an isolation valve on the branch. • Added a Storz adapter with cap on branch. <u>Safety Injection Pump Discharge Header Modifications</u> The FLEX connections on the SIPs discharge headers for HP FLEX Pumps RCS makeup are located on AB elevation 692.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The secondary connection and BAT FLEX connection are located inside the AB. The AB is a safety related structure and is protected from all external hazards except flooding. The RWST connections are seismically qualified and missile protected. For connections required during flood conditions, procedures ensure that hoses are connected before flood levels reach the connection.

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 2:		
and 6 IP FLEX pumps pre-staged on elevation 692 in the Auxiliary Building. Figure A3-11. Power supply for the 480v motor driven Mode 5 & 6 IP FLEX Pumps is from the 480v C & A Vent Boards. Power supply routing and options can be found in Attachment 3, Figures A3-21, A3-23 & A3-29.		

Notes:

1. System modifications are described in the "Modifications" section above and are illustrated in Attachment 3.
2. N+1 HP FLEX Pumps are pre-staged in the Auxiliary Building.
3. Attachment 3, Figures A3-8 through A3-10 provides the deployment routes from the pre-staged locations for each HP FLEX Pump to the pumps suction piping and to the primary and secondary connection points on the RCS connected systems.
4. Attachment 3, Figures A3-21 through A3-29 provide FLEX power distribution information for 480v motor driven FLEX Pumps.

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 3:	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain RCS Inventory Control. Identify method (borated high pressure RCS makeup) and strategy (ies) utilized to achieve this coping time. This section discusses RCS inventory control and subcriticality issues for conditions where SGs are available. RCS inventory control and subcriticality issues for conditions where SGs are not available are addressed in the reactor core cooling and heat removal section of this report. Reactor level and sub-criticality is adequately maintained via the Phase 2 strategy. For Phase 3, Watts Bar will continue the Phase 2 coping strategies with additional assistance provided from offsite equipment/resources. The Strategic Alliance for FLEX Emergency Response (SAFER) was selected by the Nuclear Strategic Issues Advisory Committee (NSIAC) to provide offsite National SAFER Response Centers (NSRC) for the nuclear industry in the United States. The NSRC provides additional capability and redundancy of equipment and resources until power, water, and coolant injection components or systems are restored or commissioned. There are 2 NSRC sites. One located in Memphis, TN and another in Phoenix, AZ. Once the call is made to the NSRC, they will provide ground and/or air transportation of the equipment to WBN staging areas B, C, or D within 24 hours. Staging area B is the area north of the EDG building. Staging area C is the Rockwood Municipal Airport located 34 driving miles from WBN. Staging area D is the Cleveland Regional Jetport which is 45 driving miles from WBN. Once the equipment is onsite WBN will utilize it based on plant conditions and if needed to replace or augment operating FLEX Phase 2 equipment. Additional details for NSRC activation and the equipment that will be provided and delivered can be found in the WBN SAFER playbook, “SAFER Response Plan for Watts Bar Nuclear” (Reference 31).	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs, and SOIs, has been developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considered the NSSS specific guidance. TVA NPG has included in CECC EPIP - 3, Operations Duty Specialist Procedure For Alert, Site Area Emergency or General Emergency notification of the NSRC to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities. (Reference 40)
Identify Modifications	Each of the Phase 3 strategies will utilize common connections or adapters as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. CET Temperature** 2. RCS HL Temperature (T_{hot}) if CETs not available 3. RCS CL Temperature (T_{cold})* 4. RCS wide range pressure 5. RCS Passive Injection Level 6. Pressurizer Level 7. RVLIS (backup to Pressurizer level) – available for up to 27 hours for limiting flood scenario, at which point pressurizer level is available again. 8. Neutron Flux

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 3:	
	For all instruments listed above the normal power source and the long-term power source is the 125v DC Vital Battery. *This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for Tcold is SG pressure when natural circulation is occurring. This substitution is allowed by guidance provided in Reference 16. **This instrumentation is available until flood water enters the auxiliary instrument room. The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Watts Bar has developed procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06. (Reference 32)

Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
Mobile water purification units and mobile boration units are provided by SAFER/NSRC. The water purification units will provide demineralized water makeup to the AFWST, makeup to the mobile boration units or other uses. The mobile boration units can supply 1000 gallon batches of borated water to the RWSTs, SFP or other uses. In a flood event the mobile water purification units and boration units would be staged and aligned once flood waters receded below plant grade.	Each of the Phase 3 strategies will utilize common connections or adapters as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The discharge connection points are identical to the ones used for Phase 2. The protection of those connection points is described in the section for Phase 2 for RCS Inventory Control.
Notes: None		

Maintain Containment	
PWR Installed Equipment Phase 1:	
Determine Baseline coping capability with installed coping[3] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • **Containment Spray** • **Hydrogen igniters**	
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain containment. Watts Bar has performed a containment evaluation based on the boundary conditions described in Section 2 of NEI 12-06. Based on the results of this evaluation, required actions to ensure maintenance of containment integrity and required instrumentation function have been developed. (Reference 41) There are no phase 1 actions required at this time that need to be addressed.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support implementation of this strategy, including interfaces to EOIs, special event procedures, AOIs, and SOIs, have been developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considered the NSSS specific guidance.
Identify Modifications	1. 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871).
Key Containment Parameters	*List instrumentation credited for this coping evaluation.* 1. Containment Pressure* 2. Containment Temperature** *Watts Bar relies on existing installed 125v DC Vital Batteries to power key instrumentation and emergency lighting. A battery coping calculation determined that the battery coping time is 8 hours. (Reference 30). **This instrumentation is only available until flood water enters the technical support center (TSC) inverter or station battery rooms. Watts Bar has developed a procedure to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06. (Reference 32)
Notes: None	

[3] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain Containment	
PWR Portable Equipment Phase 2:	
Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain containment. Identify method (hydrogen igniters) and strategy (ies) utilized to achieve this coping time. Watts Bar has performed a containment analysis based on the boundary conditions described in Section 2 of NEI 12-06. (Reference 41). Based on the results of this analysis, required actions to ensure maintenance of containment integrity and required instrumentation function have been developed. (Reference 53). At approximately 60 hours into the event the containment analysis recommends a 10 minute run of a Containment Air Return Fan. This operation ensures ice condenser doors open and enhanced flow through the ice condenser and benign containment conditions for a significant period of time past T+72 hours. (Reference 41 and Reference 53). The onsite 6.9KV FLEX DGs also provide the ability to recover operation of Lower Compartment Coolers (LCCs) for containment temperature control, if required. Cooling water would be provided to the LCCs by deployed diesel powered LP FLEX Pumps feeding the ERCW system headers and alignment of the ERCW system to maximize efficient usage of available cooling water. (Reference 53 and Reference 54). Additionally, the 6.9KV FLEX DGs can power the hydrogen igniters through the 480v shutdown power distribution system, if required. The 480v FLEX DGs discussed in the safety functions support section can also be aligned to provide power to the hydrogen igniter supply transformers, if required.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs, and SOIs, has been developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considered the NSSS specific guidance.
Identify Modifications	1. FLEX Equipment Storage Building (FESB). (DCN 59084). 2. FLEX connections have been provided on the ERCW headers in the IPS for the LP FLEX Pumps to pressurize the ERCW headers during non-flood and flood conditions. (DCN 60684). 3. FLEX connections have been provided on the ERCW headers in the 5th DG Building for the LP FLEX Pumps to pressurize the ERCW headers during flood conditions. (DCN 60684). 4. 225kva DGs (480v FLEX DGs) (DCN 59675). 5. 3 MWe DGs (6.9KV FLEX DGs) (DCN 60853). 6. Miscellaneous - Installed storage boxes in the IPS and 5th DG Building for hoses, fittings, tools required for implementation. Installed concrete pads and reinforced roads where required for FLEX equipment deployment. (DCN 62889).
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. Containment Pressure* 2. Containment Temperature** *For this instrumentation, the normal power source and the long-term power source are the 125v DC Vital Battery. **This instrumentation is only available until flood water enters the TSC inverter or station battery rooms.

Maintain Containment	
Storage / Protection of Equipment: Describe storage / protection plan or schedule to determine storage requirements	
Seismic	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is appropriately protected or located within a class I structure. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, which is designed to the same Seismic Category I requirements as the AB. Seismic input for the design corresponds to the appropriate seismic accelerations at the roof of the AB. This design provides a seismic protection of 2x SSE HCLPF.
Flooding	The 6.9KV FLEX DGs are pre-staged inside the FESB which is located above the PMF elevation. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is designed to withstand PMF waters, is appropriately protected or located within a class I structure. The 480v FLEX DGs are pre-staged on the roof of the AB, which is sited in a suitable location that is above the PMF and as such is not susceptible to flooding from any source.
Severe Storms with High Winds	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is appropriately protected or located within a class I structure. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, which is sited in a suitable location that is protected from NRC region 1 tornado, missiles and velocities as defined in Nuclear Regulatory Commission (NRC) Regulatory Guide 1.76 Revision 1.
Snow, Ice, and Extreme Cold	The 6.9KV FLEX DGs are pre-staged inside the FESB. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The FESB is provided with an HVAC system to maintain the internal environment between 50 and 100°F up to the point of ELAP. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, and has been evaluated for snow, ice and extreme cold temperature effects and heating has been provided as required to assure no adverse effects on the FLEX equipment.
High Temperatures	The FESB will be evaluated for high temperature effects and ventilation will be provided as required to assure no adverse effects on the FLEX equipment. The FESB will have a standalone HVAC system to maintain the internal environment between 50 and 100°F up to the point of ELAP. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, and has been evaluated for high temperature effects and ventilation is provided as required to assure no adverse effects on the FLEX equipment.

Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
The hydrogen igniters can be repowered by the 6.9KV FLEX DGs that are pre-staged inside the FESB or by the 480v FLEX DGs that are pre-staged on the roof of the AB. Additionally, repowering the 6.9KV and 480v Shutdown Electrical distribution system provides the ability to operate Containment Air Return Fans and other containment ventilation components (i.e., Lower Compartment Coolers), if required.	The 6.9KV FLEX DGs can provide power to the Hydrogen Igniter transformers via the normal shutdown power distribution system which powers the 480v portions of the system. (DCN 60853). The 480v FLEX DGs that are pre-staged on the roof of the AB can also be aligned to power the Hydrogen Igniter transformers, if required. (DCN 59675).	The protection structures for the 6.9KV FLEX DGs and the 480v FLEX DGs and the diverse power distribution system are protected from the five external hazards, as described in this section.
Notes: None		

Maintain Containment		
PWR Portable Equipment Phase 3:		
Provide a general description of the coping strategies using Phase 3 equipment including modifications that are proposed to maintain containment. Identify method (hydrogen igniters) and strategy (ies) utilized to achieve this coping time. Watts Bar has performed a containment evaluation based on the boundary conditions described in Section 2 of NEI 12-06. Based on the results of this evaluation, required actions to ensure maintenance of containment integrity and required instrumentation function have been developed. (Reference 41) The hydrogen igniters can be powered through the 6.9KV Shutdown Power and 480v Shutdown Power distribution systems. (See PWR Portable Equipment Phase 3 Medium Voltage and Low Voltage Backup listings).		
Details:		
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs, and SOIs, have been developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considered the NSSS specific guidance. TVA NPG has included in CECC EPIP - 3, Operations Duty Specialist Procedure For Alert, Site Area Emergency or General Emergency notification of the NSRC to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities. (Reference 40).	
Identify Modifications	The same modification as Phase 2 applies for Phase 3.	
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* 1. Containment Pressure* 2. Containment Temperature** * For this instrumentation, the normal power source and the long-term power source is the 125v DC Vital Battery. * Watts Bar has a procedure to read this instrumentation locally, if required, using a portable instrument as required by Section 5.3.3 of NEI 12-06. (Reference 32). ** This instrumentation is only available until flood water enters the TSC inverter or station battery rooms.	
Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
The same modification, as Phase 2 applies for Phase 3.	The same modification, as Phase 2 applies for Phase 3.	All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis safe shutdown earthquake (SSE) protection requirements. The same modification, as Phase 2 applies for Phase 3.
Notes: None		

Maintain Spent Fuel Pool Cooling
PWR Installed Equipment Phase 1:
Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • **Makeup with Portable Injection Source**
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy(ies) utilized to achieve this coping time. Reference 18 summarizes that there will be no significant volume lost from the SFP due to sloshing. A small range of critical damping factors were investigated and it was shown that the critical damping factor had no influence on the amount of water sloshed out of the pool. However, for all critical damping factors, there was water lost into the ventilation ducts regardless of the direction of the seismic motion. The volume of the water lost in the ducts was conservatively calculated to be 59.5 ft^3. Access to the SFP area as part of Phase 2 response could be challenged due to environmental conditions near the pool. Therefore, the required action is to establish ventilation in this area and establish any equipment local to the SFP required to accomplish the coping strategies (such as the primary SFP cooling strategy discussed below). If the air environment in the SFP area requires the building to be ventilated, doors will be opened to establish air movement and venting the SFP building. For accessibility, establishing the SFP vent and any other actions required inside the fuel handling building should be completed before boil off occurs. <u>Operating, pre-fuel transfer or post-fuel transfer</u> Considering no reduction in SFP water inventory starting from nominal pool level, this results in a time when boil off decreases the water level to 10 feet above the SFP racks of approximately 85 hours for an SSE seismic event with an initial bulk water temperature in the pool of 100°F. This value was calculated using the normal operating decay heat load. Considering the maximum possible loss of water through the vents in SFP water inventory starting from nominal pool level, this results in a time when boil off occurs of approximately 18.69 hours for an safe shutdown earthquake (SSE) seismic event and an initial bulk water temperature in the pool of 100°F. This value was calculated using the normal operating decay heat load. Time to boil the level to 10 ft. above the fuel racks (~735 ft.) for normal operating decay heat load is determined below. Note that the top of the fuel is at ~749 ft. and the boil off rate for normal decay heat load is 32.56 gpm as stated in Reference 18. A volume of level per inch of 104.38 ft^3/in is from Reference 18. Time to boil down to 10 ft. above (749-735=14 ft. = 168 in) fuel racks: $$=168\text{in}\times\frac{104.38\text{ft}^3}{\text{in}}\times\frac{1\text{gal}}{0.13368\text{ft}^3}\times\frac{1\text{min}}{32.56\text{gal}}\times\frac{1\text{hour}}{60\text{min}}=67.15+18.69=85.84\text{hours}$$ <u>Fuel in Transfer or Full Core Offload</u> For the maximum credible heat load and an initial water temperature in the pool of 140°F, the time when boil off decreases the water level to 10 feet above the SFP racks is approximately 30 hours. Considering the maximum possible loss of water through the vents in SFP water inventory starting from nominal pool level, this results in a time when boil off occurs of approximately 4.58 hours for a SSE seismic event and an initial bulk water temperature in the pool of 140°F. This value was calculated using the maximum operating decay heat load, as summarized in Reference 18. Time to boil the level to 10 ft. above the fuel racks (~735 ft.) for maximum credible heat load is determined below. Note that the top of the fuel is

[4] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

at ~749 ft. and the boil off rate for maximum credible heat load is 83.98 gpm as stated in Reference 18. Time to boil down to 10 ft. above (749-735=14 ft. = 168 in) fuel racks: $= 168\text{in} \times \frac{104.38\text{ft}^3}{\text{in}} \times \frac{1\text{gal}}{0.13368\text{ft}^3} \times \frac{1\min}{83.98\text{gal}} \times \frac{1\text{hour}}{60\min} = 26.03 + 4.58 = 30.61\text{hours}$ In order to keep the pool at a constant level of coolant (thus covering the top of the spent fuel), the LP FLEX pumps will be required to pressurize the ERCW headers to provide makeup to prevent a decrease in the level of the SFP.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support implementation of this strategy, including interfaces to EOIs, special event procedures, AOIs, and SOIs, will be developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considers the NSSS specific guidance.
Identify Modifications	1). 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871). 2). Two independent SFP level instruments have been added to facilitate remote monitoring of SFP level in response to NRC Order EA 12-051. (DCN 59683).
Key SFP Parameter	The implementation of DCN 59683 aligned WBN with the requirements of NRC Order EA 12-051 and NEI 12-02. These SFP Level instruments are powered from the 120v AC Vital Power System. The primary power supply to Spent Fuel Level Continuous Monitoring Loop 1 (0-LI-78-43) is from 120v AC Vital Power Board 2-III with its individual power supply battery backup (0-BAT-78-43). The primary power supply to Spent Fuel Level Continuous Monitoring Loop 2 (0-LI-78-42) is from 120v AC Vital Power Board 2-IV with its individual battery backup power supply (0-BAT-78-42). The 120v AC Vital Power Boards are powered by 120v AC Vital Inverters fed by its 125v DC Vital Battery Board. (Reference 39).
Notes:	

Maintain Spent Fuel Pool Cooling	
PWR Portable Equipment Phase 2:	
Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy (ies) utilized to achieve this coping time. The transition to Phase 2 strategies will be as the inventory in the SFP slowly declines due to boiling. Initial SFP makeup should be from the Demineralized Water Head Tank until it is depleted. SFP cooling through makeup and/or spray will be provided by using LP FLEX pumps providing raw cooling or makeup water to the ERCW headers providing the capability for makeup from a FLEX connection and hose deployment directly into the pool or by spray from portable FLEX spray nozzles or by FLEX connection and hose deployment into existing SFP Demineralized Water System Makeup piping. Through completion of proceduralized ERCW system alignment [0-FSI-5.05, ERCW Alignment for 5000 GPM Portable Diesel Pump (5PDP)] to focus raw cooling water availability and verification of 6.9KV FLEX DG loading necessary CCS and Spent Fuel Pool Cooling Pumps may be energized to restore SFP cooling capability. <u>Operating, Pre-fuel Transfer or Post-fuel Transfer</u> Considering no reduction in SFP water inventory starting from nominal pool level, results in a time when boil off decreases the water level to 10 feet above the SFP racks of approximately 85 hours for an SSE seismic event with an initial bulk water temperature in the pool of 100°F. This value was calculated using the normal operating decay heat load, shown in the Phase 1 section for Maintaining Spent Fuel Pool Cooling. <u>Fuel in Transfer or Full Core Offload</u> For the maximum credible heat load and an initial water temperature in the pool of 140°F, the time when boil off decreases the water level to 10 feet above the SFP racks is approximately 30 hours, shown in the Phase 1 section for Maintain Spent Fuel Pool Cooling. To provide an unlimited supply of water for SFP makeup during Phase 2, LP FLEX pumps will be used to pressurize the ERCW headers which can then be used for makeup to the SFP FLEX mitigation strategies. For restoration of SFP cooling Watts Bar has the capability to repower one train of normal pool cooling equipment. This would include the use of LP FLEX pumps on site to provide flow to the CCS heat exchanger, ERCW System realignment per FSI-5.05 to focus raw cooling water availability and the pre-staged 6.9KV FLEX DGs to repower the necessary CCS and SFP cooling pumps. The primary SFP makeup flow method is from the ERCW header connections on Elevation 757 from FLEX connections at the ERCW to CCS spool pieces (next to the CCS Surge Tanks) through a hose or hoses to the SFP. The secondary SFP makeup is a new FLEX connection added to the SFP Demineralized Water System (DWS) makeup line on elevation 737. Supply to this FLEX connection could come from an ERCW FLEX connection on AB elevation 737 (primary) or from an available clean water source via transfer pump, if available (secondary). This secondary makeup capability provides makeup control when the refueling floor is not accessible. Both FLEX connections can be accessed during both flood and non-flood conditions. Watts Bar will provide portable (fire-fighting type) spray nozzle capability based on a flow of 500 gpm, which equals the FLEX requirement to provide 250 gpm of spray flow per unit to the spent fuel pool.	
Details:	
Provide a brief description of Procedures / Strategies /	Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs and SOIs, will be developed in accordance with NEI 12-06, Revision 0, Section 11.4.

Maintain Spent Fuel Pool Cooling	
Guidelines	Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considers the NSSS specific guidance.
Identify Modifications	*List modifications* 1. FLEX connections have been provided at the ERCW headers in the IPS for the LP FLEX Pumps to pressurize the ERCW headers during non-flood and flood conditions. (DCN 60684). 2. FLEX connections have been provided at the ERCW headers in the 5th DG Building for the LP FLEX Pumps to pressurize the ERCW headers during non-flood or flood conditions. (DCN 60684). 3. FLEX connections have been provided on the ERCW headers in the AB elevation 737 for supplying raw water. (DCN 60684). 4. FLEX connections have been provided to the Tritiated Water Storage Tank (TWST), Primary Water Storage Tanks (PWSTs), and Demineralized Water Storage Tank for water transfer capability. (DCN 60684, DCN 60683, DCN 61784 & EDCR 60993). 5. The primary SFP FLEX connections with Storz fittings are located at the ERCW to CCS spool pieces (next to the CCS Surge Tanks) on Refuel floor elevation 757. These can supply direct makeup or spray if required. (DCN 60684). 6. The secondary SFP FLEX connection is located on Auxiliary Building elevation 737 (a tee, upstream isolation valve and FLEX connection are provided) on the Demineralized Water System piping leading to the SFP. (DCN 60684). 7. 225kva DGs (480v FLEX DGs). (DCN 59675). 8. 3 MWe DGs (6.9KV FLEX DGs). (DCN 60853). 9. 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871). 10. Two independent SFP level instruments have been added to facilitate remote monitoring of SFP level in response to NRC Order EA 12-051. (DCN 59683). 11. Miscellaneous - Installed storage boxes in the AB, IPS and 5th DG Building for hoses, fittings, tools required for implementation. Installed concrete pads and reinforced roads where required for FLEX equipment deployment. (DCN 62889).
Key SFP Parameter	The implementation of this parameter will align with the requirements of NRC Order EA 12-051 and NEI 12-02. These SFP Level instruments are powered from the 120v AC Vital Power System. The primary power supply to Spent Fuel Level Continuous Monitoring Loop 1 (0-LI-78-43) is from 120v AC Vital Power Board 2-III with its individual power supply battery backup (0-BAT-78-43). The primary power supply to Spent Fuel Level Continuous Monitoring Loop 2

Maintain Spent Fuel Pool Cooling	
	(0-LI-78-42) is from 120v AC Vital Power Board 2-IV with its individual battery backup power supply (0-BAT-78-42). The 120v AC Vital Power Boards are powered by 120v AC Vital Inverters fed by its 125v DC Vital Battery Board. (Reference 39).
Storage / Protection of Equipment: Describe storage / protection plan or schedule to determine storage requirements	
Seismic	Equipment required to implement this FLEX strategy is staged in the Auxiliary Building or the FESB, both are designed for seismic loading in excess of the minimum requirements of American Society of Civil Engineers (ASCE) 7-10. The SFP level instruments are mounted in the AB which is a protected structure. The design of the FESB provides a minimum HCLPF of 2x SSE. The 480v FLEX DGs are installed on the AB roof in a protected enclosure.
Flooding	The 6.9KV FLEX DGs are pre-staged inside the FESB, which is located above the PMF elevation. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is designed to withstand PMF waters, is appropriately protected or located within a class I structure. The 480v FLEX DGs are pre-staged on the roof of the AB, which is sited in a suitable location that is above the PMF and as such is not susceptible to flooding from any source. The SFP Level Instrumentation is located in the AB on the refuel floor elevation 757 with the level indication readout and backup power supply battery packs located in the shutdown board rooms on elevation 757. These are above PMF levels.
Severe Storms with High Winds	Equipment required to implement this FLEX strategy is staged in the AB a class 1 structure or in the FESB, which is sited in a suitable location that is protected from NRC region 1 tornado, missiles, and velocities as defined in NRC Regulatory Guide 1.76 coupled with 360 mph wind speeds (Reference 5 Paragraph 2.3.1). The SFP level instruments are mounted in the AB, which is a protected structure. The 480v FLEX DGs are installed on the AB roof in a protected enclosure.
Snow, Ice, and Extreme Cold	The AB and the FESB have been evaluated for snow, ice and extreme cold temperature effects and heating is provided as required to assure no adverse effects on FLEX equipment or SFP level instrumentation. The FESB will have a standalone HVAC system. The 480v FLEX DGs are installed on the AB roof in a protected enclosure.

<table>
<tr><th colspan="3">Maintain Spent Fuel Pool Cooling</th></tr>
<tr><td>High Temperatures</td><td colspan="2">The AB and FESB have been evaluated for high temperature effects and ventilation is provided as required to assure no adverse effects on FLEX equipment or SFP level instrumentation. The FESB has a standalone HVAC system. The 480v FLEX DGs are installed on the AB roof in a protected enclosure.</td></tr>
<tr><td colspan="3">Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)</td></tr>
<tr><td>Strategy</td><td>Modifications</td><td>Protection of connections</td></tr>
<tr><td>Identify Strategy including how the equipment will be deployed to the point of use.</td><td>Identify Modifications</td><td>Identify how the connection is protected</td></tr>
<tr><td>The primary method is flow from the ERCW headers at two AB elevation 757 locations using adapters and hose connections. This strategy can be implemented in flood and non-flood conditions.

The proposed hose routing for the primary method and the associated equipment can be found in Attachment 3, Figure A3-14 through A3-16. The system connection point can be found in Attachment 3, Figure A3-12.

Note that SFP spray would be routed in an identical manner; however, the end of the hose could have the spray nozzle installed.

ERCW connections can be found in Attachment 3, Figures A3-17 and A3-18.</td><td>The primary SFP FLEX connection modification will be an adapter where a hose connection can be installed at the ERCW supply valve to the CCS Surge Tank flood mode spool piece. (DCN 60684).

<u>ERCW Modifications</u>

The same modifications required to pressurize ERCW headers are described under Phase 2 Maintain Core Cooling and Heat Removal.</td><td>All FLEX equipment connection points will be designed to meet or exceed Watts Bar design basis SSE protection requirements.

The primary and secondary connections are in the Auxiliary Building, which is seismically qualified and missile protected. The primary connection is above the PMF.</td></tr>
<tr><td>The secondary SFP connection will be to the DWS makeup line, on Elevation 737 of the AB. This strategy can be implemented in flood and non-flood conditions.

FLEX hose will be routed from this location, across the floor on Elevation 737, to the ERCW cleanout port FLEX connections.

The proposed hose routing for the secondary connection and the</td><td>The secondary SFP FLEX connection modification includes:
• A tee added to the DWS makeup line to the SFP
• An isolation valve added to the main line upstream of the connection.
• An isolation valve added to the new branch.
• Storz cap/adapter added to the</td><td>All FLEX equipment connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements.

The connection point is in the Auxiliary Building, which is seismically qualified and missile protected. Hose routing to the primary connection will be performed before flood conditions make the area inaccessible.</td></tr>
</table>

Maintain Spent Fuel Pool Cooling		
associated equipment can be found in Attachment 3, Figure A3-14 through A3-16. The system connection point can be found in Attachment 3, Figure A3-13. ERCW connections can be found in Attachment 3, Figures A3-17 and A3-18.	new branch. The modification that added FLEX connections to the ERCW cleanout ports described in the Reactor Core Cooling and Heat Removal section also applies to this case due to the location of the connection point. (DCN 60684).	
Two independent SFP level instrument loops have been provided. One loop on the Unit 1 plant side on the Northwest corner of the SFP provides a SFP level indication mounted on the South wall of the A Train 6.9KV Shutdown Board. One loop on the Unit 2 plant side on the Southeast corner of the SFP provides a SFP level indication mounted on the South wall of the B Train 6.9KV Shutdown Board.	Two SFP level instruments have been added to facilitate remote monitoring of SFP level in response to NRC Order EA 12 - 051. (DCN 59683).	These SFP level instrument loop mounting are designed to meet or exceed Watts Bar design basis SSE protection requirements. All components are located in the AB, which is seismically qualified and missile protected. These SFP Level instruments are powered from the 120v AC Vital Power System. The primary power supply to Spent Fuel Level Continuous Monitoring Loop 1 (0-LI-78-43) is from 120v AC Vital Power Board 2-III with its individual power supply battery backup (0-BAT-78-43). The primary power supply to Spent Fuel Level Continuous Monitoring Loop 2 (0-LI-78-42) is from 120v AC Vital Power Board 2-IV with its individual battery backup power supply (0-BAT-78-42). The 120v AC Vital Power Boards are powered by 120v AC Vital Inverters fed by its 125v DC Vital Battery Board. (Reference 39).

Notes:

1. System modifications are described in the "Modifications" section above and are illustrated in Attachment 3.
2. Figures A3-14 through A3-16 in Attachment 3 provides the hose routing for the SFP makeup strategies.

Maintain Spent Fuel Pool Cooling	
PWR Portable Equipment Phase 3:	
Provide a general description of the coping strategies using Phase 3 equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy (ies) utilized to achieve this coping time.	
Details:	
The strategies described for Phase 2 can continue as long as there is sufficient inventory available to feed the strategies. See SAFER/NSRC description and reference in the Phase 3 Details section for Maintaining Core Cooling and Heat Removal or the RCS Inventory Control sections.	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs, and SOIs, have been developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considers the NSSS specific guidance. TVA NPG has included in CECC EPIP - 3, Operations Duty Specialist Procedure For Alert, Site Area Emergency or General Emergency notification of the NSRC to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities. (Reference 40).
Identify Modifications	N/A
Key SFP Parameter	The implementation of this parameter will align with the requirements of NRC Order EA 12-051 and NEI 12-02. These SFP Level instruments are powered from the 120v AC Vital Power System. The primary power supply to Spent Fuel Level Continuous Monitoring Loop 1 (0-LI-78-43) is from 120v AC Vital Power Board 2-III with its individual power supply battery backup (0-BAT-78-43). The primary power supply to Spent Fuel Level Continuous Monitoring Loop 2 (0-LI-78-42) is from 120v AC Vital Power Board 2-IV with its individual battery backup power supply (0-BAT-78-42). The 120v AC Vital Power Boards are powered by 120v AC Vital Inverters fed by its 125v DC Vital Battery Board. (Reference 39).

Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
The description for the mobile water purification and mobile boration units will be the same as was mentioned for the other functions.	The description for the mobile water purification system will be the same as was mentioned for the other functions.	The description for the mobile water purification system will be the same as was mentioned for the other functions.
The primary and secondary methods would remain the same. The difference would be the drivers which would be the NSRC delivered equipment, if they were	The following FLEX connections provide potential connection points or adapters for Phase 3 portable pumps (suction source and discharge options) if they are	All FLEX connection points are designed to meet or exceed Watts Bar design basis SSE protection requirements. The connection points in the AB,

Maintain Spent Fuel Pool Cooling		
required. The primary method is flow from the ERCW headers at two AB elevation 757 locations using adapters and hose connections. This strategy can be implemented in flood and non-flood conditions. The proposed hose routing for the primary method and the associated equipment can be found in Attachment 3, Figure A3-14 through A3-16. The system connection point can be found in Attachment 3, Figure A3-12. Note that SFP spray would be routed in an identical manner; however, the end of the hose could have the spray nozzle installed. ERCW connections can be found in Attachment 3, Figures A3-17 and A3-18. The secondary SFP connection will be to the DWS makeup line, on Elevation 737 of the AB. This strategy can be implemented in flood and non-flood conditions. FLEX hose will be routed from this location, across the floor on Elevation 737, to the ERCW cleanout port FLEX connections. The proposed hose routing for the secondary connection and the associated equipment can be found in Attachment 3, Figure A3-14 through A3-16. The system connection point can be found in Attachment 3, Figure A3-13. ERCW connections can be found in Attachment 3, Figures A3-17 and A3-18.	required to be deployed: 1. FLEX connections have been provided at the ERCW headers in the Intake Pumping Station (IPS) for the LP FLEX Pumps to pressurize the ERCW headers during non-flood and flood conditions. (DCN 60684). 2. FLEX connections have been provided at the ERCW headers in the 5th DG Building for the LP FLEX Pumps to pressurize the ERCW headers during non-flood or flood conditions. (DCN 60684). 3. FLEX connections have been provided on the ERCW headers in the AB elevation 737 for supplying raw water. (DCN 60684). 4. FLEX connections have been provided to the Tritiated Water Storage Tank (TWST), Primary Water Storage Tanks (PWSTs), and Demineralized Water Storage Tank (DWST) for potential water transfer capability. (DCN 60684, DCN 60683, DCN 61784 & EDCR 60993). 5. The primary SFP FLEX connections with Storz fittings are located at the ERCW to CCS spool pieces (next to the CCS Surge Tanks) on Refuel floor elevation 757. These can supply direct makeup or spray if required. (DCN 60684). 6. The secondary SFP FLEX connection is located on AB elevation 737 (a tee, upstream isolation valve and FLEX connection are provided) on the Demineralized Water System piping leading to the SFP. (DCN 60684).	IPS or 5th DG Building are seismically qualified and missile protected.
Notes:		

Maintain Spent Fuel Pool Cooling
1. System modifications are described in the "Modifications" section above and are illustrated in Attachment 2. Figures A3-14 through A3-16 in Attachment 3 provides the hose routing for the SFP makeup strategies.

Safety Functions Support
Determine Baseline coping capability with installed coping[5] modifications not including FLEX modifications.
PWR Installed Equipment Phase 1
Provide a general description of the coping strategies using installed equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy (ies) utilized to achieve coping times. Analysis using conservative heat loads in the Control and Auxiliary Buildings has shown that installed equipment credited for mitigation response will remain available. In addition, accessibility of these areas for required actions is acceptable. (Reference 14). Habitability and Operations Operating Conditions Following a BDBEE and subsequent ELAP event, plant heating, ventilation and air conditioning (HVAC) in occupied areas and areas containing permanent plant and FLEX mitigation strategy equipment will be lost. Per NEI 12-06, FLEX mitigation strategies must be capable of execution under the adverse conditions (unavailability of normal plant lighting, ventilation, etc.) expected following a BDBEE resulting in an ELAP/LUHS. The primary concern with regard to ventilation is the heat buildup which occurs with the loss of forced ventilation in areas that continue to have heat loads. A loss of ventilation analyses was performed to quantify the maximum steady state temperatures expected in specific areas related to FLEX mitigation strategy implementation to ensure the environmental conditions remain acceptable for personnel habitability and within equipment qualification limits. (Reference 14). The areas identified for all phases of execution of the FLEX mitigation strategy activities are the MCR, Shutdown Board Rooms, AB, TDAFWP rooms, EDG Building, 5th DG Building, FESB and IPS. These areas have been evaluated to determine the temperature profiles following an ELAP/LUHS event. The calculation has concluded that temperatures remain within acceptable limits based on conservative input heat load assumptions for all areas with no actions being taken to reduce heat load or to establish either active or passive ventilation (e.g., portable fans, open doors, etc.). In the case of the TDAFW Pump rooms the pump room doors will be opened and left open to facilitate natural circulation and ensure that the temperatures remain within the acceptable range for equipment and personnel. The temperatures expected in the MSVVs for local operation of SG PORVs, if required, are similar to conditions experienced during normal station operations, testing, and maintenance. Therefore, actions performed for FLEX activities will be essentially the same as those evaluated for the current site procedure ECA-0.0, Loss of All AC Power or B.5.b strategies, which also address potential local operation of the TDAFWP, AFW LCVs and/or SG PORVs. Off-gassing of hydrogen from batteries is only a concern when the batteries are charging. Vital Battery Room doors will be blocked open to facilitate natural ventilation. Lighting In an ELAP event initial lighting for the MCR and Shutdown Board Room areas is provided by the plant designed 125v DC powered emergency lighting system, designated by the LD prefix. This system now utilizes LED light bulbs which have enhanced 125v Vital Battery coping capability. (Reference 30). The Auxiliary Control Room (ACR), access and egress routes and areas that must be attended for safe shutdown

5 Coping modifications consist of modifications installed to increase initial coping time, i.e., g enerators topreserve vital instruments or increase operating time on battery powered equipment.

operations are provided with 8 hour emergency battery lighting (EBL) units. The EBL units that support safe shutdown and emergency access and egress are routinely referred to as Appendix 'R' battery packs. These Appendix 'R' EBLs are upgrading to LED bulbs, which provide extended battery pack life. Tasks required to implement FLEX mitigation strategies including traveling to/from the various areas necessary to implement the FLEX strategies, making performing instrumentation monitoring, and component manipulations are similar to tasks previously walked down for ECA-0.0 Loss of Shutdown Power, B.5.b and Appendix 'R' Safe Shutdown operations.

These emergency lights are periodically tested under the plant's preventative maintenance program to insure the battery pack will provide a minimum of eight (8) hours of lighting with no external AC power sources.

Communications

Watts Bar Unit 1 & 2 communications systems and equipment are designed and installed to ensure reliability of onsite and offsite communications in the event of a design basis or BDBEE. WBN's ELAP mitigation capability benefits from a previously planned upgrade of WBN's radio communication system. DCN 60384 has converted the analog Nextel Radio System to a trunked VHF and UHF digital system with new multi-ban handheld radios. The new radio system hardware (cabinets, repeaters, hand held radios, etc.) are provided by the Harris Corporation.

Three regulatory rules from the Code of Federal Regulations (CFR) that are satisfied by the system upgrade are:

- Emergency Preparedness (EP): both an on site and offsite communication system exists with a normal and backup power supply.
- Security: constant communication between the Central Alarm Station (CAS) and any officer in the field at all times.
- 10CFR50 Appendix R for fire protection: communication method is available to respond to certain Design Basis fires with in the plant.

Six new cabinets containing communication equipment have been installed inside the AB, a class I structure protected against environmental events such as seismic, tornado, high winds, extreme cold or high temperatures and they and their power supplies are located above site probable maximum flood elevation.

Five cabinets are installed in the 480v shutdown board room 2A on AB elevation 772. These cabinets are normally powered from safety related normal and backup 120V AC feeds. The normal feeds (which would not be available in Phase I of an ELAP event) are from 480v Reactor MOV Board 2A1-A or 2B1-B (transformed 480v AC to 120v AC) and the back up feed power supply capability (which would be powering the Harris Radio system during Phase I) is provided through either 120v AC Vital Instrument Power Board 2-III or 2-IV. The 120V AC Vital Instrument Power Boards are fed from their designated vital inverter powered respectively by 125v Vital Battery III or IV.

The sixth cabinet is installed in the 480v Shutdown Transformer Room 2B on AB elevation 772. The sixth cabinet and radio is separated from the other five cabinets to address Appendix R requirements and is powered from a safety related 120V AC Instrument Power Distribution Panel 2B (2-BD-237-B). This cabinet would not be available during Phase I of an ELAP event.

WBN maintains a sound powered phone system. There are four plant sound powered phone sub-divisions: Shutdown Sound Powered System, Plant Operations Sound Powered System, Health Physics Sound Powered System and Diesel Generator Sound Powered System. The sound-powered telephone system is a communication system which utilizes telephone instruments in which the transmitters and receivers are passive transducers; external power is not required since operating power is obtained from the speech input only. These systems provide two communication functions, the first of which is to furnish voice communications when conventional voice circuits are inoperative, and the second of which is to furnish voice communications for plant operation or maintenance purposes. The Shutdown Sound Powered System is the only sound power communication system designed expressly for supporting the emergency shutdown of the reactors, if required. This system consists of fixed and portable sound powered telephones and jack circuits for two separate, redundant circuits called the primary system and alternate system. Although this system maybe used as deemed necessary, its intended use is not for normal plant operations. It provides a backup communication vehicle for operations in the Auxiliary Control Room (ACR), 6900v and 480v Shutdown Board Rooms, AB elevation 692 near TDAFWP rooms, EDG Building and North and South MSVVs elevation 729 near SG PORVs during an emergency. It is not accessible in the MCR. Instructions are provided in plant System Operating Instruction (SOI) and an 'AOI-27' cabinet outside of the ACR contains sound powered communication headsets and support equipment. This system is active in the plant's preventative maintenance program.

TVA purchased 17 IsatPhone PRO global handheld satellite phones for Watts Bar. The SatPhone Battery Life is Talk Time: Up to 8 Hours; Standby Time: Up to 100 Hours. These phones are deployed in the MCR at the Shift Manager - Senior Reactor Operator's (SRO) desk, in the TSC, Central Alarm Station (CAS), Environmental Monitoring Vans, with individuals on-site, and in the Emergency Planning (EP) office area. In addition, spare batteries are kept fully charged that are available at the TSC, CAS, and EP offices. This gives the individual phones 16 hours of talk time before recharging is needed. The phone in the vans is charged using the standard 12V adapter and will remain available throughout the duration of the event.

A fixed docking station, IsatDock PRO allows the IsatPhone Pro handset to be interfaced with a PBX system presenting standard ring, busy and dial tones like a standard phone network. This docking station is located in the NODE 2, Telecommunications Building. The phone is located in the MCR, TSC, and OSC.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs, and SOIs, will be developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considers the NSSS specific guidance.
Identify Modifications	*List modifications and describe how they support coping time.* 1. 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871). The replacement of incandescent lamps with LED lamps in emergency lighting for the Main Control Room and Shutdown Board Rooms and Appendix R Light Packs provides for additional margin on the 125v DC Vital Battery Systems.
Key Parameters	*List instrumentation credited for this coping evaluation phase.* • 125v DC Vital Battery Bus Voltage (for 125v DC Vital Batteries I, II, III & IV). Watts Bar relies on existing installed 125v DC Vital Batteries to power key instrumentation and emergency lighting. A battery coping calculation determined that the battery coping time is 8 hours. (Reference 30).
Notes:	

Safety Functions Support
PWR Portable Equipment Phase 2

Provide a general description of the coping strategies using on-site portable equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy (ies) utilized to achieve coping times.

Analysis using conservative heat loads in the Control and Auxiliary Buildings has shown that installed equipment credited for mitigation response will remain available. In addition, accessibility of these areas for required actions is acceptable. (Reference 14).

The on-site 480v FLEX DGs are pre-staged to provide power to the 125v DC Vital Batteries and through the Vital Inverters the 120v AC Vital Instrument Power System. These generators are pre-staged on the Auxiliary Building roof and will be protected from external hazards with an initial supply of fuel for 8 hours of operation. Once the fuel and control cable FLEX connections are complete to ensure continuous fuel supply to the 480v FLEX DGs there is not an issue with 125v Vital DC coping capability.

Additionally, the onsite 6.9KV FLEX DGs are pre-staged in the FESB to provide power to the existing 6.9KV Shutdown Power distribution system and via the 480v Shutdown Transformers the 480v Shutdown Power distribution system. The 6.9KV FLEX DGs also provide an alternative power source capability for the loads supplied by the on-site 480v FLEX DGs. The 6.9KV FLEX DGs' electrical distribution network is protected from the external hazards discussed in this document.

Habitability and Operations

Operating Conditions

Following a BDBEE and subsequent ELAP event, plant heating, ventilation and air conditioning (HVAC) in occupied areas and areas containing permanent plant and FLEX mitigation strategy equipment will be lost. Per NEI 12-06, FLEX mitigation strategies must be capable of execution under the adverse conditions (unavailability of normal plant lighting, ventilation, etc.) expected following a BDBEE resulting in an ELAP/LUHS. The primary concern with regard to ventilation is the heat buildup which occurs with the loss of forced ventilation in areas that continue to have heat loads. A loss of ventilation analyses was performed to quantify the maximum steady state temperatures expected in specific areas related to FLEX mitigation strategy implementation to ensure the environmental conditions remain acceptable for personnel habitability and within equipment qualification limits. (Reference 14).

The areas identified for all phases of execution of the FLEX mitigation strategy activities are the MCR, Shutdown Board Rooms, AB, TDAFWP rooms, EDG Building, 5th DG Building, FESB and IPS. These areas have been evaluated to determine the temperature profiles following an ELAP/LUHS event. The calculation has concluded that temperatures remain within acceptable limits based on conservative input heat load assumptions for all areas with no actions being taken to reduce heat load or to establish either active or passive ventilation (e.g., portable fans, open doors, etc.) In the case of the TDAFW Pump rooms, Safety Injection Pumps rooms, and the PD Pumps rooms (location of the HP FLEX Pumps) the pump room doors will be opened and left open to facilitate natural circulation and ensure that the temperatures remain within the acceptable range for equipment and personnel. These doors will remain open to support pump operation.

The temperatures expected in the MSVVs for local operation of SG PORVs, if required, are similar to conditions experienced during normal station operations, testing, and maintenance. Actions performed within the plant for FLEX activities will be essentially the same as those performed for the current site procedure ECA-0.0, Loss of All AC Power or potentially for B.5.b or Appendix 'R' Safe Shutdown strategies which also address potential local operation of the TDAFWP, AFW LCVs and SG PORVs.

An additional ventilation concern applicable to Phase 2 is when the 480v FLEX DGs repower the 125v Vital Battery Chargers. Off-gassing of hydrogen from batteries is only a concern when the batteries are charging.

Safety Functions Support
PWR Portable Equipment Phase 2

Vital Battery room doors will be blocked open to facilitate natural ventilation. Once the 6900v FLEX DGs restore power to the 6.9KV and 480v shutdown power distribution systems the capability of returning the battery room ventilation fans to service exists.

Lighting

In an ELAP event initial lighting for the MCR and Shutdown Board Room areas is provided by the plant designed 125v DC powered emergency lighting system, designated by the LD prefix. This system utilizes LED light bulbs. The Auxiliary Control Room (ACR), access and egress routes and areas that must be attended for safe shutdown operations are provided with 8 hour emergency battery lighting (EBL) units. The EBL units that support safe shutdown and emergency access and egress are routinely referred to as Appendix 'R' battery packs. These Appendix 'R' EBLs are upgrading to LED bulbs which provide extended battery life. Traveling to and from the various areas necessary to implement the FLEX mitigation strategies, making required mechanical connections, operating electrical disconnects and breakers, monitoring instrumentation and component manipulations are similar to tasks previously walked down for B.5.b and Appendix 'R' Safe Shutdown operations.

Battery Powered (Appendix 'R') emergency lights were determined to provide adequate lighting for all interior travel pathways needed to access the connection points. These emergency lights are designed and periodically tested under the plant's preventative maintenance program to insure the battery pack will provide a minimum of eight (8) hours of lighting with no external AC power sources.

Once the 6900v FLEX DGs repower the 6.9KV Shutdown Boards and the 480v shutdown powered distribution system the Standby Lighting system, designated by the LS prefix, could be directed to be repowered from the Reactor MOV Boards supplying lighting and placing the 125v DC powered emergency lighting system (LD system) back in a standby mode. 6900v FLEX DG loading should be evaluated prior to reenergizing the LS lighting system.

There are no emergency lighting fixtures in the yard outside of the protected area to provide necessary lighting in those areas where portable FLEX equipment is to be deployed. Therefore, the diesel powered FLEX pumps and generators are outfitted with light plants that are powered from their respective diesels to support connection and operation. In addition to the lights installed on the portable diesel powered FLEX equipment, portable diesel generator powered light stanchions, battery powered light packs and small generators to provide power and battery charging capability are available to be deployed from the FESB to support fading light or night time operations.

The FESB will also include a stock of flashlights and head lights to further assist the staff responding to an ELAP.

Communications

Watts Bar Unit 1 & 2 communications systems and equipment are designed and installed to ensure reliability of onsite and offsite communications in the event of a design basis or BDBEE. WBN's ELAP mitigation capability benefits from a previously planned upgrade of WBN's radio communication system. DCN 60384 has converted the analog Nextel Radio System to a trunked VHF and UHF digital system with new multi-ban handheld radios. The new radio system hardware (cabinets, repeaters, hand held radios, etc.) are provided by the Harris Corporation.

Three regulatory rules from the Code of Federal Regulations (CFR) that are satisfied by the system upgrade are:

Safety Functions Support
PWR Portable Equipment Phase 2

- Emergency Preparedness (EP): both an on site and offsite communication system exists with a normal and backup power supply.
- Security: constant communication between the Central Alarm Station (CAS) and any officer in the field at all times.
- 10CFR50 Appendix R for fire protection: communication method is available to respond to certain Design Basis fires with in the plant.

Six new cabinets containing communication equipment have been installed inside the AB, a class I structure protected against environmental events such as seismic, tornado, high winds, extreme cold or high temperatures and they and their power supplies are located above site probable maximum flood elevation.

Five cabinets are installed in the 480v Shutdown Board Room 2A on AB elevation 772. These cabinets are normally powered from safety related normal and backup 120V AC feeds. The normal feeds are from 480v Reactor MOV Board 2A1-A or 2B1-B (transformed 480v AC to 120v AC) and the back up feed power supply capability is provided through either 120v AC Vital Instrument Power Board 2-III or 2-IV. The 120V AC Vital Instrument Power Boards are fed from their designated vital inverter powered respectively by 125v Vital Battery III or IV. In an ELAP event the ultimate source for normal power once placed in service would be the 6900v FLEX DGs repowering the 6.9KV Shutdown and 480v AC Shutdown Power distribution systems and for the backup power feeds the 480v FLEX DGs repowering the 125v DC Vital Battery chargers ensuring continuous 125v DC coping capability and power to the 120c AC Vital Inverters.

The sixth cabinet is installed in the 480v Shutdown Transformer Room 2B on AB elevation 772. The sixth cabinet and radio is separated from the other five cabinets to address Appendix R requirements and is powered from a safety related 120V AC Instrument Power Distribution Panel 2B (2-BD-237-B).

WBN maintains a sound powered phone system. There are four plant sound powered phone sub-divisions: Shutdown Sound Powered System, Plant Operations Sound Powered System, Health Physics Sound Powered System and Diesel Generator Sound Powered System. The sound-powered telephone system is a communication system which utilizes telephone instruments in which the transmitters and receivers are passive transducers; external power is not required since operating power is obtained from the speech input only. These systems provide two communication functions, the first of which is to furnish voice communications when conventional voice circuits are inoperative, and the second of which is to furnish voice communications for plant operation or maintenance purposes. The Shutdown Sound Powered System is the only sound power communication system designed expressly for supporting the emergency shutdown of the reactors, if required. This system consists of fixed and portable sound powered telephones and jack circuits for two separate, redundant circuits called the primary system and alternate system. Although this system maybe used as deemed necessary, its intended use is not for normal plant operations. It provides a backup communication vehicle for operations in the Auxiliary Control Room (ACR), 6900v and 480v Shutdown Board Rooms, AB elevation 692 near TDAFWP rooms and North and South MSVVs elevation 729 and EDG Building near SG PORVs during an emergency. It is not accessible in the MCR. Instructions are provided in plant System Operating Instruction (SOI) and an 'AOI-27' cabinet outside of the ACR contains sound powered communication headsets and support equipment. This system is active in the plant's preventative maintenance program.

TVA purchased 17 IsatPhone PRO global handheld satellite phones for Watts Bar. The SatPhone Battery Life is Talk time: Up to 8 Hours; Standby Time: Up to 100 Hours. These phones are deployed in the MCR at the Shift Manager - Senior Reactor Operator's (SRO) desk, in the TSC, Central Alarm Station (CAS), Environmental Monitoring Vans, with individuals on-site, and in the Emergency Planning (EP) office area.

Safety Functions Support	
PWR Portable Equipment Phase 2	
In addition spare batteries are kept fully charged that are available at the TSC, CAS, and EP offices. This gives the individual phones 16 hours of talk time before recharging is needed. The phone in the vans is charged using the standard 12V adapter and will remain available throughout the duration of the event. A fixed docking station, IsatDock PRO allows the IsatPhone Pro handset to be interfaced with a PBX system presenting standard ring, busy and dial tones like a standard phone network. This docking station is located in the NODE 2, Telecommunications Building. The phone is located in the MCR, TSC, and OSC.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs, and SOIs, have been developed in accordance with NEI 12-06, Revision 0, and Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considers the NSSS specific guidance.
Identify Modifications	For the 480v FLEX DGs, two fused distribution panels will be used to provide power to the supplied loads. Each 480v FLEX DG fuse panel provides connections to two Vital Battery chargers. Each fuse distribution panel provides connection capability to the 480v AC Shutdown Power distribution system's 480V Reactor MOV Boards with the ability to close Cold Leg Accumulator Isolation Valves during cooldown, if required. In an ELAP event 'A' 480v FLEX DG would supply power to 125v DC Vital Battery Chargers I & III and 'B' 480v FLEX DG would supply power to 125v DC Vital Battery Chargers II & IV. The 'A' 480v FLEX DG schematic is shown on Attachment 3, Figure A3-22. 'B' 480v FLEX DG schematic (not shown) is similar. Fuel for the 480v FLEX DGs will be provided by the installed EDG 7-day tanks. Fuel lines will be installed between the 7-day fuel tanks mounted under the EDG building and AB roof to provide fuel to the 480v FLEX DGs with a fuel transfer pump. The 480v FLEX DGs fuel and control power FLEX connections must be completed and protected within 8 hours to ensure unlimited coping capability provided by the 480v FLEX DGs. (DCN 59675). To connect the existing 6.9KV Shutdown Power System to the 6.9KV FLEX DGs for FLEX implementation and operation, the connection to the existing safety-related DG circuit is opened and the circuits to the 6.9KV FLEX DGs are closed by operating the existing interlocked (Kirk-Key) transfer switches 1A-A, 1B-B, 2A-A, or 2B-B. The permanently installed electrical connection points for the 6.9KV FLEX DGs are from the DGs integral output connection panel through conduits within the FESB to underground conduits located on the outside of the FESB south wall. One 6.9KV FLEX DG is assigned to power Train A on both units and the second 6.9KV FLEX DG is assigned to power Train B of both units. 'A' 6.9KV FLEX DG power supply routing to 1A-A 6.9KV Shutdown Board and distribution is shown on Attachment 3, Figure A3-21.

Safety Functions Support	
PWR Portable Equipment Phase 2	
	'A' 6.9KV FLX DG would supply both 1A-A and 2A-A 6.9KV Shutdown Boards through their respective Kirk-Key disconnect switches and shutdown board emergency feeder breaker. 'B' 6.9KV FLEX DG (not shown) would supply 1B-B and 2B-B 6.9KV Shutdown Boards. The conduits meet seismic Class I requirements for safety related and quality-related structures. Actual mechanical and electrical connections to the presently installed safety related DG equipment shall meet safety related requirements at the interfaces. Refueling of the 6.9KV FLEX DGs is accomplished by separate diesel fuel transfer pumps taking suction from two separate designated EDG 7-day fuel oil tanks and transferring and maintaining fuel to the 6.9KV FLEX DGs' fuel oil day tanks. (DCN 60853).
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* • 125v DC Vital Batteries Bus Voltage For the instrument listed above the normal power source and the long-term power source are the 125v DC Vital Battery.
Storage / Protection of Equipment **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	Equipment for this function will either be stored or pre-staged in the FESB, in the AB, IPS or 5th DG Building. The protection of FLEX equipment for this hazard is addressed for each of these locations in the Reactor Core Cooling and Heat Removal and Maintain RCS Inventory Control sections.
Flooding	Equipment for this function will either be stored or pre-staged in the FESB, in the AB, IP or 5th DG Building. The protection of FLEX equipment for this hazard is addressed for each of these locations in the Reactor Core Cooling and Heat Removal and Maintain RCS Inventory Control sections.
Severe Storms with High Winds	Equipment for this function will either be stored or pre-staged in the FESB, in the AB, IPS or 5th DG Building. The protection of FLEX equipment for this hazard is addressed for each of these locations in the Reactor Core Cooling and Heat Removal and Maintain RCS Inventory Control sections.
Snow, Ice, and Extreme Cold	Equipment for this function will either be stored or pre-staged in the FESB, in the AB, IPS or 5th DG Building. The protection of FLEX equipment for this hazard is addressed for each of these locations in the Reactor Core Cooling and Heat Removal and Maintain RCS Inventory Control sections.
High Temperatures	Equipment for this function will either be stored or pre-staged in the FESB, in the AB, IPS or 5th DG Building. The protection of FLEX equipment for this hazard is addressed for each of these locations in the Reactor Core Cooling and Heat Removal and Maintain RCS Inventory Control sections.

Safety Functions Support		
PWR Portable Equipment Phase 2		
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
The strategy for this function is described above in the Identify Modifications section.	1. 225kva DGs (480v FLEX DGs). (DCN 59675) 2. 3 MWe DGs (6.9KV FLEX DGs) (DCN 60853) 3. 8 Hour Battery Coping. (EDC/DCN 60976, DCN 60384 & PIC to DCN 54871) Note: The Harris Radio system modification is included in DCN 60384.	The 6.9KV FLEX DGs are pre-staged inside the FESB above the PMF elevation. The FESB is a formidable structure designed and built to withstand 2X SSE HCLPF and 360 MPH winds. The distribution system from the FESB to the EDG Building is protected and from the kirk-key switches located in the EDG through the 6.9KV and 480v safety class electrical distribution system is appropriately protected or located within a class I structure. The 480v FLEX DGs are pre-staged on the roof of the AB. A protection structure has been built around the DGs, which is designed to the same Seismic Category I requirements as the AB. Seismic input for the design corresponds to the appropriate seismic accelerations at the roof of the AB. This design provides a seismic protection of 2xSSE HCLPF. The electrical distribution systems are located in the EDG building and/or the AB, which are protected structures.
Notes: None.		

Safety Functions Support		
PWR Portable Equipment Phase 3		
Provide a general description of the coping strategies using Phase 3 equipment including modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy (ies) utilized to achieve coping times. See SAFER/NSRC description and reference in the Phase 3 Details section for Maintaining Core Cooling and Heat Removal or the RCS Inventory Control sections. A backup or alternate set of Phase 2 equipment will be provided by the NSRC or from offsite TVA sources, as needed.		
Details:		
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOIs, special event procedures, AOIs, and SOIs, will be developed in accordance with NEI 12-06, Revision 0, Section 11.4. Further, the PWROG has developed generic guidance, and Watts Bar's strategy aligns with the generic guidance and considers the NSSS specific guidance. TVA NPG has included in CECC EPIP - 3, Operations Duty Specialist Procedure For Alert, Site Area Emergency or General Emergency notification of the NSRC to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities. (Reference 40)	
Identify Modifications	N/A	
Key Parameters	No additional instrumentation is required to support the Phase 3 safety function support.	
Deployment Conceptual Design (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify Modifications*	*Identify how the connection is protected*
A backup to or alternate set of Phase 2 equipment will be provided by the NSRC or offsite TVA sources, as needed.	Each of the Phase 3 strategies utilize common connections or adapters as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.	There are no unique phase 3 connection points for this strategy. All phase 3 equipment will be provided by offsite resources.
Notes: None		

PWR Portable Equipment Phase 2							
Use and (potential/flexibility) diverse uses						*Performance Criteria*[1]	*Maintenance*
List portable/pre-staged equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		**Maintenance / PM requirements**
Two Pre-Staged Medium Voltage Diesel Generators (6900v FLEX DGs) - Repowers 6.9 KV Shutdown Boards.	X	X	X	X	X	6900v AC 3 MWe	Follows EPRI template requirements.
Two Pre-Staged Low Voltage Diesel Generators (480v FLEX DGs) - Powers the 125v DC Vital Battery Chargers.	X	X	X	X	X	480v AC 225 kva	Follows EPRI template requirements
Three (Dominator) Low Pressure (LP) FLEX Pumps (Pressurizes ERCW Headers)	X	X	X			5000 gpm 150 PSIG [350 ft. Total Dynamic Head (TDH)] Diesel Driven	Follows EPRI template requirements
Three (Triton) LP FLEX Pump Systems - each consist of 2 floating hydraulically driven booster pumps supplying positive suction to the Low Pressure FLEX Pumps (Dominators).	X	X	X			5000 gpm 50 ft. lift Diesel Powered Hydraulically Driven Floating Booster Pumps	Follows EPRI template requirements
Two Intermediate Pressure FLEX Pumps (Core Cooling Makeup Pumps - Non-Flood Events)	X		X			150 gpm 350 PSIG (823 ft. TDH) Diesel Driven	Follows EPRI template requirements

[1] Performance criteria of FLEX equipment is conservative and was determined during conceptual design as a basis for the selection of required FLEX equipment. (Reference 20).

PWR Portable Equipment Phase 2							
Use and (potential/flexibility) diverse uses						***Performance Criteria[1]***	***Maintenance***
List portable/pre-staged equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		**Maintenance / PM requirements**
Two Pre-Staged Intermediate Pressure FLEX Pumps (Core Cooling Makeup Pumps - Flood Event)	X					150 gpm 350 PSIG (823 ft. TDH) 480v AC Motor Driven	Follows EPRI template requirements
Two Pre-Staged Mode 5 & 6 FLEX Pumps (RCS Core Cooling and Makeup Pumps - Non-Flood or Flood Event)	X					150 gpm 350 PSIG (823 ft. TDH) 480v AC Motor Driven	Follows EPRI template requirements
Three Pre-Staged High Pressure FLEX Pumps (RCS Inventory Control -Non-Flood or Flood Event)	X					40 gpm 600 PSIG (1384 ft. TDH) 480v AC Motor Driven	Follows EPRI template requirements
Two Water Transfer Pumps	X		X			500 gpm 160 PSIG (374 ft. TDH) Diesel Driven	Follows EPRI template requirements
Two SFP Spray Nozzles			X			250 gpm per nozzle	Follows EPRI template requirements
Two Heavy Duty 4X4 Vehicles capable of debris removal, deployment of FLEX equipment, personnel transport and refueling diesel powered FLEX equipment.	X	X	X	X	X	Capable of on-site debris removal, deployment of trailer mounted FLEX equipment, transport of personnel, refueling of diesel powered FLEX equipment. Equal to or greater tow capacity of 14,000 Gross Vehicle	Follows EPRI template requirements

PWR Portable Equipment Phase 2							
Use and (potential/flexibility) diverse uses						***Performance Criteria*** [1]	***Maintenance***
List portable/pre-staged equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		**Maintenance / PM requirements**
						Weight (GVW). Each truck has a bed mounted 500 gallon fuel tank and fuel transfer pump.	
Fuel Transfer Equipment • One Diesel Powered Fuel Transfer Pump • One Portable Electric Powered Fuel Transfer Pump	X	X	X	X	X	Provides refuel capability by fuel transfer from the EDG 7-day tanks or surviving fuel oil storage tanks to the truck mounted 500 gallon fuel tanks or transfer from tank to tank .	Follows EPRI template requirements
Debris Clearing Equipment One Compact Track Loader. The previously identified tow vehicles (4X4 trucks) equipped for debris removal duty, if required.	X	X	X		X	Capable of clearing trees, light poles, building, fencing or wire, construction materials and/or miscellaneous debris. One 4X4 truck is equipped with a heavy duty front mounted 16.5 ton winch and a second truck is mounted with a debris or snow removal plow.	Follows EPRI template requirements

PWR Portable Equipment Phase 3							
Use and (potential/flexibility) diverse uses						***Performance Criteria*** [1]	**Phase 3 NSRC/SAFER Equipment or Other available offsite equipment.**
List portable/pre-staged equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		
Medium Voltage Diesel Generator Backup	X	X	X	X	X	6900v AC capable of powering minimum mitigation strategy equipment	Use of TVA owned 2.2 MW Diesel Generator(s) and 480v to 6.9KV transformer(s).
Low Voltage Diesel Generator Backup	X	X	X	X	X	480v AC 225 kva	Low Voltage Generator
Low Pressure FLEX Pumps (Dominator) (Pressurizes ERCW Headers)	X	X	X			5000 gpm 150 PSIG (350 ft. TDH) Diesel Driven	Low Pressure High Flow Pumps (150psi/5000gpm)
Floating Booster Pumps (Triton) - Supplies Low Pressure FLEX Pump (Dominator).	X	X	X			5000 gpm 50 ft. lift Diesel Driven	Low Pressure High Flow Suction Booster Pumps (5000gpm at 26 foot head)
Intermediate Pressure FLEX Pumps (Core Cooling Backup Pumps Non-Flood Event)	X		X			150 gpm 350 PSIG (823 ft. TDH) Diesel Driven	SG Makeup/RCS Makeup Capable Pumps (500PSI/500gpm)
Intermediate Pressure FLEX Pumps (Core Cooling Backup Pump - Flood Event)	X		X			150 gpm 350 PSIG (823 ft. TDH) 480v AC	See Above - SG Makeup/RCS Makeup Capable Pump (500PSI/500gpm)

[1] Performance criteria of FLEX equipment is conservative and was determined during conceptual design as a basis for the selection of required FLEX equipment.

PWR Portable Equipment Phase 3							
Use and (potential/flexibility) diverse uses						*Performance Criteria* [1]	**Phase 3 NSRC/SAFER Equipment or Other available offsite equipment.**
List portable/pre-staged equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		
Mode 5 & 6 FLEX Pumps (RCS Core Cooling and Makeup Pumps - Non-Flood or Flood Event)	X					150 gpm 350 PSIG (823 ft. TDH) 480v AC	See Above - SG Makeup/RCS Makeup Capable Pump (500PSI/500gpm)
High Pressure FLEX Pumps Backup (RCS Inventory Control)	X					40 gpm 600 PSIG (3561 ft. TDH) 480v AC	High Pressure Injection Pump (1500PSI/60gpm)
Water Transfer Pumps Backup	X		X			500 gpm 160 PSIG (374 ft. TDH) Diesel Driven	Low Pressure Medium Flow Pumps (300PSI/2500gpm)
Fuel Transfer Equipment • Fuel Tankers • Diesel Fuel Oil Transfer Pumps	X	X	X	X	X	2 - Tankers - 500 gallons Minimum each Transfer Pumps - 1 Diesel Driven and 1 Portable Electric	Portable Diesel Fuel Tanks with Fuel Transfer Pumps (364 gallon tank with AC/DC powered transfer pumps)
Reverse Osmosis Units/ Water Purification (provide makeup to the AFWST, water for blending borated makeup for the RCS and other uses)	X		X			The Reverse Osmosis units will have an output flow capability of 250 gpm per unit.	Portable makeup water treatment system capable of supplying purified water.

PWR Portable Equipment Phase 3							
Use and (potential/flexibility) diverse uses						***Performance Criteria*** [1]	**Phase 3 NSRC/SAFER Equipment or Other available offsite equipment.**
List portable/pre-staged equipment	**Core**	**Containment**	**SFP**	**Instrumentation**	**Accessibility**		
Mobile Boration Units (provide blended borated makeup to the RWSTs, SFP and /or other uses).	X		X			The 1000 gallon per batch mobile boration skids provide the capability for batching borated water for RCS makeup and/or other uses.	Portable units capable of supplying borated water for RCS makeup.

Phase 3 Response Equipment/Commodities	
Item	**Notes**
Radiation Protection Equipment • Survey instruments • Dosimetry • Off-site monitoring/sampling • Radiological counting equipment • Radiation protection supplies • Equipment decontamination supplies • Respiratory protection • Portable Meteorological (MET) Tower .	

Commodities
• Food
  ○ Meals Ready to Eat (MRE)
  ○ Microwaveable Meals
• Potable water	

Fuel Requirements • Diesel Fuel	
Heavy Equipment • Transportation equipment ○ 4 wheel drive tow vehicles • Debris clearing equipment	If the Equipment Support Services (ESS) facility located on the TVA Watts Bar Reservation survives the initiating event various pieces of heavy equipment will be available to assist in FLEX equipment and personnel deployment, debris removal, or other required remedial activities. Additionally, TVA as the largest public electrical power utility in the U. S. has access to heavy equipment, resources and other support services from its system wide transmission, hydro and fossil departments, other nuclear sites and its various service shops.
Communications Equipment • Satellite Phones • Portable Radios	
Portable Interior Lighting • Flashlights • Headlamps • Batteries	
Portable Exterior Lighting • Diesel generator powered light units	NSRC will supply additional portable exterior light units**.**

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Open Items

Open item Number	Description	Status	Notes
1	The current condensate storage tank (CST) is a non-seismic tank that is not missile protected. The site is currently pursuing two options; the qualification and hardening of the existing CST or the construction of a new seismically qualified and missile protected CST. One of these options must be completed before the volume of the CST can be credited.	Closed	A new seismically qualified and hardened 500,000 gallon Auxiliary Feedwater Supply Tank (AFWST) has been constructed. DCN 60060 & DCN 62324 for AFW Supply Tank DCN 61422 for tie in to existing Unit 1 plant piping.
2	Liquefaction of haul routes for FLEX will be analyzed.	Closed	See Reference 22
3	No detailed analysis has been provided regarding initial FLEX fuel supplies to determine a need time for access to 7 day tank supplies or resupply of the 7 day tanks. It is assumed that each FLEX component is stored with a minimum supply of 8 hours of fuel at constant operation. This assumption will need to be assessed once all FLEX equipment has been purchased and equipment specifications are known.	Closed	Fuel consumption spreadsheet completed to show that fuel supply will last seven days.
4	No need time has been identified for action to protect containment. This includes actions to mitigate pressurization of containment due to steaming when reactor coolant system (RCS) vent paths have been established or actions to mitigate temperature effects associated with equipment survivability. An evaluation will be provided to prove indefinite containment coping.	Closed	See Reference 41
5	The Phase 3 equipment staging area has not been determined.	Closed	Areas are identified and will be included with the Regional Response Center (NSRC) playbook. See Reference 31.
6	A strategy for clearing and removing debris will be determined.	Closed	Debris removal equipment is identified and storage determined.
7	A thorough analysis of the makeup flow rate requirements and other equipment characteristics will be finalized during the detailed design phase of FLEX.	Closed	Detailed FLEX Operating Conditions and pump sizing has been completed (See Reference 20).

Open item Number	Description	Status	Notes
8	The need time for spent fuel pool (SFP) cooling actions (deployment of hose, venting, and alignment of makeup) was determined using worst case heat loads. This item will continue to be assessed and later action times may be acceptable. Note that the timing for this step during an outage is different, but resources will be available to complete the required actions.	Closed	See Reference 18.
9	Functional requirements for each of the Phase 3 strategies, equipment and components will be completed at a later time and will be provided in the six month updates to the February 28, 2013 submittal.	Closed	See Reference 31.
10	Containment temperature instrumentation is only available until flood waters enter the technical support center (TSC) inverter or station battery rooms. A method to monitor containment temperature, post-flood, will be developed.	Closed	See Reference 41 Section 5.3, and Reference 43.
11	The heating, ventilation and air conditioning (HVAC) analysis is preliminary, and has not been finalized.	Closed	Calculation ID: MDQ0003602013000272. RIMS #: 130830 801.
12	Verify ability to deploy FLEX equipment to provide core cooling in Modes 5 and 6 with steam generators (SGs) unavailable. If it is determined that gravity feed is not effective to cool the RCS and prevent fuel damage, Watts Bar will take actions to proceduralize administrative controls to pre-stage FLEX equipment prior to entering a condition where the SGs cannot provide adequate core cooling.	Closed	See Reference 38.

Open item Number	Description	Status	Notes
13	An evaluation of the impact of FLEX response actions on design basis flood mode preparations will be performed. This evaluation will include the potential for extended preparation time for FLEX. Changes which affect the Integrated Plan will be included in the six month update.	Closed	TVA's River Systems Operation (RSO) will notify the WBN control room if Watts Bar Hydro instantaneous flow rate reaches 170,000 cfs, which approximates the 25 year flood frequency based upon observed historical flow data. This notification will provide for initiation and completion of preparatory FLEX equipment deployment and mitigation strategy implementation prior to conditions that might trigger a Stage 1 Flood Warning from RSO. See Reference 44.
14	Further analysis will be performed to determine the required timeline for implementing the 6.9 KV FLEX diesel generators (DGs) as an alternate power source for the loads supplied by the 480 V FLEX DGs.	Closed	The revised timelines show that the 6.9 KV FLEX DGs are available within 5 hours. Updated sequence of events for both flood and non-flood conditions have been completed by TVA. They are added to this letter in Attachment 1A, Sequence of Events Timeline.
15	The CETs are only available until water enters the auxiliary instrument room. A method to monitor CET, post flood, will be evaluated and developed, if required.	Closed	CETs will not be required for flood event.
16	Strategies to address extreme cold conditions on the refueling water storage tank (RWST) and/or boric acid tanks (BATs), including potential need to reenergize heaters have not been finalized.	Closed	The RWST will remain above freezing and boric acid precipitation will not occur for the duration of the phase 2 coping strategy. The BAT which is located in the AB below plant grade elevation will remain a reasonable and justified back-up strategy. See Reference 45.
17	Establish an agreement with the Strategic Alliance for FLEX Emergency Response (SAFER) team in accordance with the requirements of Section 12 of NEI 12-06.	Closed	Agreement with Regional Response Center (NSRC) is in place. See Reference 31.
18	Manual station blackout (SBO) load shedding time in References 4 and 5, Section 8.3.2.1.1, will be revised from 30 minutes to 45 minutes as supported by the 8 hour extended loss of alternating current power (ELAP) battery calculations.	Closed	This item from the initial OIP submittal is no longer applicable since Watts Bar is no longer required to perform the initial SBO load shed. See Reference 30.

ACRONYMNS

AB	auxiliary building
ABMT	auxiliary boration makeup tank
AC	alternating current
ACR	auxiliary control room
ACS	alternate coolant system
ADAMS	agency wide documents access and management systems
AFW	auxiliary feedwater
AFWST	auxiliary feedwater supply tank
AOI	abnormal operating instruction
AOP	abnormal operating procedure
AOV	air-operated valve
APM	available physical margin
ARV	atmospheric relief valve
ASCE	American Society of Civil Engineers
AUO	assistant unit operator
BAT	boric acid tank
BCS	backup control station
BDB	beyond-design-basis
BDBEE	beyond-design-basis external events
CAS	central alarm station
CCS	component cooling system
CCSP	component cooling system pump
CCW	condenser circulating water
CET	core exit thermocouple
CFR	Code of Federal Regulations
CFS	cubic feet per second
CLA	cold leg accumulator
CST	condensate storage tank
CVCS	chemical and volume control system
CWST	cask washdown storage tank
DBFL	design basis flood level
DBE	design basis event
DBF	design basis flood
DC	direct current
DCN	design change notice
DG	diesel generator
DGB	diesel generator building
DWHT	demineralized water head tank
DWST	demineralized water storage tank
EBL	emergency battery lighting
EDG	emergency diesel generator
EDC	engineering document change
EDCR	engineering document construction release
EDG	emergency diesel generator
EDMG	extreme damage mitigation guideline
EDMS	electronic document management system
EFW	emergency feedwater
ELAP	extended loss of ac power
EOI	emergency operating instruction

EOP	emergency operating procedure
EP	emergency planning
EPRI	Electric Power Research Institute
ERCW	essential raw cooling water
ERO	emergency response organization
ESF	engineered safety feature
FESB	FLEX equipment storage building
FLEX	Flexible and Diverse Coping Mitigation Strategies
FMBMS	flood mode boration makeup system
FSG	FLEX support guideline
FSI	FLEX support instructions
GMRS	ground motion response spectra
HCLPF	high confidence of low probability failure
HPFP	high pressure fire protection
HP FLEX Pump	high pressure (HP) FLEX pump
HVAC	heating, ventilation, and air conditioning
IER	Industry Event Report
INPO	Institute of Nuclear Power Operations
IP FLEX Pump	intermediate pressure (IP) FLEX pump
IPS	intake pumping station
ISG	Interim Staff Guidance
LB	licensing basis
LCV	level control valve
LOCA	loss of coolant accident
LOOP	loss of offsite power
LP FLEX Pump	low pressure (LP) FLEX pump
LUHS	loss of normal access to the ultimate heat sink
MCC	motor control centers
MCR	main control room
MDAFWP	motor driven auxiliary feedwater pump
MOV	motor operated valve
MRE	meals ready to eat
MSL	mean sea level
MSVV	main steam valve vault
NEI	Nuclear Energy Institute
NPSH	net positive suction head
NRC	Nuclear Regulatory Commission
NSAIC	Nuclear Strategic Issues Advisory Committee
NSRC	National SAFER Response Center
NSSS	nuclear steam supply system
NTTF	Near-Term Task Force
OBE	operating basis earthquake
OCC	Operations Control Center
OPDP	operability determination process
OSC	operation support center
PD	positive displacement
PIC	post issuance change
PORV	power operated relief valve
PMF	probable maximum flood
PMP	probable maximum precipitation
PRA	probabilistic risk assessment

PWR	pressurized water reactor
PWROG	Pressurized Water Reactor Owners Group
PWST	primary water storage tank
QR	quality related
RCP	reactor coolant pump
RCS	reactor coolant system
REOC	River Emergency Operations Center
RHR	residual heat removal
RLGM	review level ground motion
RSO	River Systems Operation
RVLIS	reactor vessel level indicating system
RWST	refueling water storage tank
RWT	raw water tank
SAFER	Strategic Alliance for FLEX Emergency Response
SAMG	severe accident management guideline
SBO	station blackout
SDM	shutdown margin
SFP	spent fuel pool
SG	steam generator
SIP	safety injection pump
SIS	safety injection system
SMA	seismic margin assessment
SOI	System Operating Instruction
SPP	standard department procedure
SPRA	seismic probabilistic risk assessment
SR	safety related
SRO	senior reactor operator
S/RVs	safety/relief valves
SSC	systems, structures and components
SSE	safe shutdown earthquake
TD	turbine-driven
TDH	total dynamic head
TSC	technical support center
TDAFWP	turbine driven auxiliary feedwater pump
TOAF	top of active fuel
TVA	Tennessee Valley Authority
TWST	tritiated water storage tank
UFSAR	updated final safety analysis report
UHS	ultimate heat sink

Attachment 1A
Sequence of Events Timeline
Non-Flood Event

Action Item(s)	Elapsed Time from Event Initiation (T-0)	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
	0	Event Starts	N	NA	Plant @100% power
	0	SBO	N	NA	ECA-0.0 (Reference 17)
1	Within 1 hour of T-0	Declare ELAP	Y	Equal to or Less Than 1 hour from T-0	ELAP entry can be verified by control room staff when it is validated that Off-Site Power, Generation (switchyard) and the Emergency Diesel Generators (EDGs) are not available. This declaration needs to occur within 1 hour from T-0 to provide operators with guidance to perform ELAP actions.
2	0.5 hours	Align and place in service the 480v FLEX Diesel Generators (DGs)	Y	0.75 hours	This provides charging current to the 125v DC Vital Batteries and ensures 125v DC Vital Battery power (control) and through the Vital Inverters 120v AC Vital Instrument Power (instrument indication).
3	1 hour	Verify 125v DC Vital Battery Chargers energized and supplying required load to the 125v DC Vital Batteries. **IF** not, **THEN** complete ELAP Load Shed (Extended Load Shed) for any Vital Battery not being supplied its required load.	Y	Complete within 1.5 hours of T-0 Minimum duration 0.5 hours.	This step ensures each 125v DC Vital Battery Charger once picked up by its designated 480v FLEX DG is charging its designated Vital Battery. If not, then the ELAP Load Shed must be completed within 90 minutes (1.5 hours) from T-0 for the affected battery (ies). This ensures an 8 hour coping time for the affected 125v DC Vital Battery (ies).

Action Item(s)	Elapsed Time from Event Initiation (T-0)	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
4 & 5	0.5 hour	Damage Assessment and FLEX Equipment Staging	N	2 hours	Watts Bar has developed a post event damage assessment procedure. The damage assessment will evaluate and document the condition of plant systems, structures and components (SSCs) after an ELAP event. FLEX equipment staging locations and access routes will be a priority for the damage assessment. This assessment will facilitate debris removal, if required, to support FLEX equipment deployment.
6	1 hour	Stage and align Low Pressure (LP) FLEX pumps (Triton and Dominator)	Y	4.5 hours	LP FLEX Pumps staged and aligned to take suction from the intake channel with discharge hoses routed to the Essential Raw Cooling Water (ERCW) FLEX connections inside the Intake Pumping Station (IPS). An alternate or additional raw water source could come from the CCW Cooling Tower basin supplying suction to a LP FLEX Pump (Dominator) with its discharge hoses routed to FLEX (or B.5.b) connections at the 5th DG Building.

Action Item(s)	Elapsed Time from Event Initiation (T-0)	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
7	Within 1 hour of T-0	RCS Depressurization and Cooldown.	Y	3 hours	At rated RCS pressure a potential leakage rate of 20.3 gpm per RCP following the event is possible. At a cold leg pressure of 1485 psig a potential leakage rate of 23.6 gpm per RCP is possible. (Reference 35 & Reference 55) RCS cooldown rate of 75 to 100° F/hr should be sustained until stabilized at ~ 300 psig SG pressure. Maintain RCS pressure greater than 250 psig to avoid Cold Leg Accumulator nitrogen injection into the RCS. Cooldown and depressurization should be stabilized within T+4 hours.
Note: The Technical Support Center (TSC) will direct when the reduction to the long term cooling plateau of 160 psig SG pressure will take place.					
8	1.5 hours	6.9KV FLEX DGs (FESB), kirk-key transfer switches (EDG Bldg.) and 6.9 KV Shutdown Boards, emergency feeder breakers and 480 V Shutdown Board Alignment (Shutdown Board Rooms).	Y	2 hours	This is to ensure switching at the DG building and shutdown board rooms are complete, potential board loading is reduced and interlocks are cleared to allow the emergency feeder breakers to be used to safely power the 6.9 KV Shutdown Boards from the 6.9KV FLEX DGs.

Action Item(s)	Elapsed Time from Event Initiation (T-0)	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
9	3.5 hours	Energize the 6.9 KV Shutdown Boards with the 6.9KV FLEX DGs. Place the following components in service and restore RCS pressurizer level: • Component Cooling System (CCS) Pumps. • Safety Injection Pumps (SIPs) , as required to recover and maintain RCS pressurizer level.	Y	1.5 hour	Action initiated is to support operation of the SIP providing restoration of RCS inventory, compensating for potential RCP seal leakage and shrinkage from cooldown.
Note: The MDAFWPs and the Auxiliary Air Compressors can be placed in service and serve as the secondary or backup SG makeup source, if required.					
10	5 hours	Place the following equipment in service, if required. Verify 6.9KV FLEX DG loading between component starts. • Auxiliary Air Compressors • Motor Driven Auxiliary Feedwater Pumps (MDAFWP) • Spent Fuel Pool (SFP) Cooling Pump (Restore SFP cooling).	N	2 hours	Action initiated, if required, to support repowering various installed pumps to facilitate ease of operation and provide indefinite coping capability.
11	4 hours	Complete 480v FLEX DGs power and fuel line routing and connections (between EDG Building south wall and AB north wall) and replace hose and cable routing protective covers. Complete alignments and verify DGs day tank fuel oil makeup.	Y	2 hours	Required to ensure continuous fuel supply from the EDG 7-day tanks to the 480v FLEX DGs day tanks. Note that this activity could be initiated earlier if maintenance resources are available.

Action Item(s)	Elapsed Time from Event Initiation (T-0)	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
12 & 20	5 hours	Initiate alignment of ERCW headers to ensure cooling water supplied by the LP FLEX Pumps is effectively directed to support FLEX Strategies.	N	7 hours	The realignment of ERCW headers are parallel responsibilities for assigned AUOs and ROs. The majority of the realignment will be accomplished by closure of MOVs once the Reactor MOV Boards are repowered by the 6.9KV FLEX DGs.
13	6 hours	Stage and align the High Pressure (HP) FLEX Pumps with suction from Refueling Water Storage Tank (RWST) FLEX connections. {Alternate is from the Boric Acid Tank (BAT) FLEX connection for boration}.	N	2.5 hours	The HP FLEX pump discharge hose can be routed to either Safety Injection Pump's discharge header FLEX connection. HP FLEX Pump capability is sufficient to maintain RCS inventory once the RCS is depressurized. Makeup is required to compensate for cooldown (shrinkage and boration). Once RCS inventory is recovered the HP FLEX Pumps can maintain RCS inventory. Hoses will remain isolated and pumps out of service until required.
14	6 hours	Stage and align the Intermediate Pressure (IP) FLEX pumps at the Auxiliary Feedwater Supply Tank (AFWST) for backup for SG makeup (backup to the TDAFWP (or) MDAFWPs).	N	3 hours	Suction is aligned from the AFWST. The IP FLEX pump discharge can be routed to FLEX connections upstream of the TDAFWP Level Control Valves (LCV) (primary) or upstream of the MDAFWP LCVs (secondary). This is a contingency in case of loss of the normal SG makeup capabilities. Hoses will remain isolated and pumps out of service until required.

Action Item(s)	Elapsed Time from Event Initiation (T-0)	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
15	6 hours	Deploy hoses and spray nozzles as a contingency for SFP makeup.	Y	2 hours	Hoses will be routed from an Auxiliary Building elevation 757 ERCW FLEX connection to the SFP area or from an elevation 737 ERCW FLEX connection to the demineralized water FLEX connection on elevation 737 to allow makeup to the SFP.
16	7 hours	Initiate fueling operations for diesel powered FLEX equipment.	N	Continuous from initiation	This will need to be established within 8 hours of initiation of diesel power FLEX equipment operation. Note that this action could be initiated earlier in the event if resources are available.
17	Once directed by the TSC	Reduce SG pressure to 160 psig per ECA-0.0	N	2 hours	This action occurs after TCS authorization and after RCS inventory has been restored by SIP operation , required SDM verified and CLAs isolated to ensure against nitrogen injection into the RCS.
18	7 hours	Makeup to the AFWST will need to be evaluated. The AFWST provides approximately 15 hours for 2 unit operation. If the Condensate Storage Tanks survive the event an additional inventory of quality water will be available, allowing additional time for makeup to the AFWST. (Reference 46).	N	Continuous from initiation	Sources of makeup to the AFWST are identified and FLEX connections are provided to facilitate transfer of quality water. Alignment to the ERCW system, an ultimate heat sink source, via the LP FLEX pumps remains an option.

Action Item(s)	Elapsed Time from Event Initiation (T-0)	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
19	7 hours	Initiate portable lighting for MCR, Shutdown Board Room and FLEX equipment locations, as required.	N	Continuous from initiation	This is not a time constraint. MCR and Shutdown Board Rooms are provided with battery backup lighting. Portable lighting for FLEX equipment staging locations could be required. Portable lighting will be available for internal and external service, if required.
21 - 24	7 hours	Monitor TDAFWP Room, Main Control Room (MCR), Shutdown Board Room, Vital Battery Board Room and SFP area ventilation needs.	N	Continuous from initiation	If required, verify 6.9KV FLEX DG loading and restore selected heating, ventilation and air conditioning (HVAC) systems to service. (Reference 14)
25 & 26	7 hours	Evaluate, identify and address long term (within 72 hours) needs including: • Mobile water purification units • Mobile boration units • Site diesel and gasoline fuel service.	N	Continuous	

Attachment 1A

Sequence of Events Timeline

Flood Event

Action Item(s)	Elapsed Time from Event Initiation T-0	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
Note: An ELAP could occur at anytime during flood preparation or a flood event therefore FLEX equipment and strategies must be staged and ready for implementation if required. **Note:** The scenario described below assumes an ELAP event occurs post initial flood warning received from TVA's River System Operations and prior to a Stage 1 warning notification. This provides a 27 hour period before flood waters reach grade elevation. This flood preparation time period allows for initial use of the same strategy as a non-flood event for Steps 1-9 for stabilizing the plant and staging FLEX equipment for flood mitigation strategy. **Note:** The permanent plant equipment incorporated into FLEX strategies that are located below Probable Maximum Flood (PMF) elevation and not designed for submerged operation will be removed from service and protection transitioned to flood capable FLEX equipment and strategies prior to flood waters reaching plant grade.					
	0	Event Starts	NA	NA	Plant @100% power
	0	SBO	N	NA	ECA-0.0 (Reference 17)
1	Within 1 hour of T-0	Declare ELAP	Y	Within 1 hour of T-0	ELAP entry can be verified by control room staff when it is validated that Off-Site Power, Generation (Switchyard) and the Emergency Diesel Generators (EDGs) are not available. This declaration needs to occur within 1 hour from T-0 to provide operators with guidance to perform ELAP actions.

Action Item(s)	Elapsed Time from Event Initiation T-0	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
2	0.5 hours	Align and place in service the 480v FLEX Diesel Generators (DGs)	Y	0.75 hours	This provides charging current to the 125v DC Vital Batteries and ensures 125v DC Vital Battery power (control) and through the Vital inverters 120v AC Vital Instrument Power (instrument indication).
3	1 hour	Verify 125v DC Vital Battery Chargers energized and supplying required load to the 125v DC Vital Batteries. **IF** not, **THEN** complete Extended Load Shed for any Vital Battery not being supplied its required load.	Y	Complete within 1.5 hours of T-0 Minimum duration 0.5 hours	This step ensures each 125v DC Vital Battery Charger once picked up by its designated 480v FLEX DG is charging its designated Vital Battery. If not, then the ELAP Load Shed must be completed within 90 minutes (1.5 hours) from T-0 for the affected battery (ies). This ensures an 8 hour coping time for the affected 125v DC Vital Battery(ies).
4 & 5	0.5 hour	Damage Assessment and FLEX Equipment Staging	N	2 hours	Watts Bar has developed a post event damage assessment procedure. The damage assessment will evaluate and document the condition of plant systems, structures and components (SSCs) after an ELAP event. FLEX equipment staging locations and access routes will be a priority for the damage assessment. This assessment will facilitate debris removal, if required, to support FLEX equipment deployment.

Action Item(s)	Elapsed Time from Event Initiation T-0	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
6	1 hour	Stage and align Low Pressure (LP) FLEX pumps (Dominator and Triton)	Y	4.5 hours	Staged and aligned to take suction from the intake channel and discharge routed to the Essential Raw Cooling Water (ERCW) FLEX connections at the Intake Pumping Station (IPS). And/or stage and align a Dominator LP FLEX Pump with suction from the CCW Cooling Tower basin and discharge hoses routed to FLEX (and/or B.5.b) connections at the 5th DG Building. Prior to flood waters exceeding the IPS staging location the LP FLEX Pumps staged there should be removed from service, IPS FLEX connection valves isolated and pumps restaged above PMF for future use.
7	Within 1 hour of T-0	RCS Depressurization and Cooldown.	Y	3 hours	At rated RCS pressure a potential leakage rate of 20.3 gpm per RCP following the event is possible. At a cold leg pressure of 1485 psig a potential leak rate of 23.6 gpm per RCP is possible. A RCS cooldown rate of 75 to 100° F/hr should be sustained until stabilized at ~ 300 psig SG pressure. Maintain RCS pressure greater than 250 psig to avoid Cold Leg Accumulator nitrogen injection into the RCS. Cooldown and depressurization should be stabilized within T+4 hours.
Note: The Technical Support Center (TSC) will direct when the reduction to the long term cooling plateau of 160 psig SG pressure will take place.					

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8	1.5 hours	6.9KV FLEX DGs (FESB), kirk-key transfer switches (EDG Bldg.) and 6.9 KV Shutdown Boards, emergency feeder breakers and 480 V Shutdown Boards alignment (Shutdown Board Rooms).	Y	2 hours	This is to ensure switching at the DG building and shutdown board rooms are complete, potential board loading is reduced and interlocks are cleared to allow the emergency feeder breakers to be used to safely power the 6.9 KV Shutdown Boards from the 6.9 KV FLEX DGs.
9	3.5 hours	Energize the 6.9 KV Shutdown Boards with the 6.9KV FLEX DGs. Place the following components in service and restore RCS pressurizer level: • Component Cooling System (CCS) Pumps. • Safety Injection Pumps, as required to recover and maintain RCS pressurizer level.	Y	1.5 hour	Action initiated to support repowering installed pumps to restore RCS inventory.
Note: The MDAFWPs and Auxiliary Air Compressors can be placed in service and serve as the secondary SG makeup source, if required.					

Action Item(s)	Elapsed Time from Event Initiation T-0	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
10	5 hours	Place the following equipment in service, if required. Verify 6.9KV FLEX DG loading between component starts. • Auxiliary Air Compressors • Motor Driven Auxiliary Feedwater Pumps (MDAFWP). • Spent Fuel Pool (SFP) Cooling Pump (Restore SFP cooling).	N	2 hours	Action initiated to support repowering various installed pumps to provide coping capability until flood waters reach plant grade and transition to FLEX mitigation strategy occurs.
11	4	Complete 480v FLEX DGs power and fuel line routing and connections (between EDG Building south wall and AB north wall) and replace hose and cable routing protective covers. Complete alignments and verify DGs day tank fuel oil makeup.	Y	2 hours	Required to ensure continuous fuel supply from the EDG 7-day tanks to the 480v FLEX DGs day tanks. Note that this activity could be initiated earlier if maintenance resources are available
12 & 21	5 hours	Initiate alignment of ERCW headers to ensure cooling water supplied by the LP FLEX Pumps are effectively directed to support FLEX Strategies.	N	7 hours	The realignment of ERCW headers are parallel responsibilities for assigned AUOs and ROs. The majority of the realignment will be accomplished by closure of MOVs once the Reactor MOV Boards are repowered by the 6.9KV FLEX DGs.
Note: If deployed, verify raw water supply to the ERCW headers from a LP FLEX Pump (Dominator) staged at the CCW Cooling Tower basin, isolate the ERCW FLEX connections inside the IPS and recover the LP FLEX Pumps (Dominator and Triton) staged at the Intake Pumping Station prior to flood waters exceeding their IPS deployment location. Relocate these pumps to the staging area north of the EDG Building (above PMF level).					

Action Item(s)	Elapsed Time from Event Initiation T-0	Action	ELAP time constraint Y/N	Task Duration (hours)	Remarks / Applicability
13	5.5 hours	Stage and align the following LP FLEX Pumps. • A second set of Low Pressure (LP) FLEX Pumps (Dominator and Triton) staged on a pad just west of the 5th DG Building.	N	2 hours	Stage a second set of Low Pressure (LP) FLEX Pumps Aligned to take suction from the road just South of the 5th Diesel Building with discharge routed to the Essential Raw Cooling Water (ERCW) FLEX (and/or B.5.b) connections inside the 5th DG Building. Hoses will remain isolated and pumps out of service until required.
14	6 hours	Stage and align the 480v Motor Driven High Pressure (HP) FLEX pumps (AB elevation 692) with suction aligned from the Refueling Water Storage Tank (RWST) FLEX connections (AB elevation 692).	N	2.5 hours	The HP FLEX pump discharge can be routed to either Safety Injection Pump discharge header's FLEX connection (B Train primary and A Train secondary). Makeup is required to compensate for cooldown (shrinkage and boration). Once RCS inventory is recovered the HP FLEX Pumps will maintain RCS inventory. Hoses will remain isolated and pumps out of service until required.

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15	6 hours	Stage and align the 480v motor driven Intermediate Pressure (IP) FLEX pumps (AB elevation 737) for makeup capability to the SGs.	N	2.5 hours	Suction hoses are aligned from the AB elevation 737 ERCW FLEX connections. The IP FLEX pumps discharge hoses can be routed to FLEX connection upstream of the TDAFWP Level Control Valves (LCVs) (SMSVV elevation 729) (primary) or FLEX connections upstream of the MDAFWP LCVs (AB elevation 737) (secondary). Hoses will remain isolated and pumps out of service until required.
16	6 hours	Deploy hoses (and if required, spray nozzles) as a contingency for SFP makeup.	Y	2 hours	Hoses will be routed from an Auxiliary Building elevation 757 ERCW FLEX connection to the SFP area or from an elevation 737 ERCW FLEX connection to the SFP demineralized water FLEX connection on elevation 737 to allow makeup to the SFP.
17	7 hours	Initiate fueling operations for diesel powered FLEX equipment.	N	Continuous once initiated	This will need to be established within 7 - 8 hours from initial operation of diesel powered FLEX equipment. Note that this action could be initiated earlier in the event if resources are available.
18	Once directed by the TSC	Reduce SG pressure to 160 psig per ECA-0.0.	N	2 hours	This action occurs after TCS authorization and after RCS inventory has been restored by SIP operation, required SDM verified and CLAs isolated to ensure against nitrogen injection into the RCS.

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19	7 hours	Makeup to the AFWST will need to be evaluated. The AFWST provides approximately 15 hours for 2 unit operation. If the Condensate Storage Tanks survive the event an additional inventory of quality water will be available prior to the requirement to makeup to the AFWST. (Reference 46).	N	Continuous once initiated	Sources of makeup to the AFWST are identified and FLEX connections are provided to facilitate transfer of quality water. Alignment to the ERCW system an ultimate heat sink source via the LP FLEX pumps remains an option.
20	7 hours	Initiate portable lighting for MCR, Shutdown Board Room and FLEX equipment locations, as required.	N	Continuous once initiated	This is not a time constraint. MCR and Shutdown Board Rooms are provided with battery backup lighting. Portable lighting for FLEX equipment staging locations could be required. Portable lighting will be available for internal and external service, if required.
22, 23 & 24	7 hours	Monitor TDAFWP Room, Main Control Room (MCR), Shutdown Board Room, Vital Battery Board Room and SFP area ventilation needs.	N	Continuous once initiated	If required, verify 6.9 KV FLEX DG loading and restore selected heating, ventilation and air conditioning (HVAC) systems to service. (Reference 14)
25 & 26	7 hours	Evaluate, identify and address long term (within 72 hours) needs including: • Mobile water purification units • Mobile boration units • Site diesel and gasoline fuel service.	N	Continuous	Once flood waters recede below plant grade the mobile water purification units and mobile boration units should be staged and aligned.

Attachment 1B

NSSS Significant Reference Analysis Deviation Table

Item	Parameter of interest	WCAP value WCAP-17601-P, Revision 1, January 2013 (Reference 8) NSAL-14-1, 02/10/2014 (Reference 51) CN-SEE-II-13-26, Revision 1 (Reference 20).	WCAP page	Plant applied value	Gap and discussion
There are no deviations.					