



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

CNL-15-007

January 30, 2015

10 CFR 50.54(f)

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

Browns Ferry Nuclear Plant, Units 1, 2, and 3
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: **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**

- References:
1. Letter from NRC to TVA, "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)
 2. Letter from TVA to NRC, "60-Day Response to 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 May 11, 2012 (ML12136A131)
 3. NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities," Revision 0, dated May 2012 (ML12125A412)
 4. Letter from NRC to Nuclear Energy Institute, "U.S. Nuclear Regulatory Commission Review of NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities," Revision 0, dated May 2012," dated May 15, 2012 (ML12131A043)

On March 12, 2012, NRC issued a letter entitled "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" (Reference 1). Enclosure 5 of Reference 1 contains the specific requested actions, requested information, and required response associated with Recommendation 9.3 for Emergency Preparedness - Staffing.

In accordance with Reference 1, Enclosure 5, TVA submitted an alternative course of action for performing the requested actions and providing the requested information (Reference 2). Enclosure 1 of Reference 2 described the alternative course of action and schedule for responding to requested information items 1, 2 and 6 for Recommendation 9.3 for Emergency Preparedness Staffing (Reference 1, Enclosure 5).

The Enclosure to this letter provides the Browns Ferry Nuclear Plant (BFN) NEI 12-01 Phase 2 Extended Loss of AC Power Emergency Response Organization (ERO) Staffing Analysis Report. This report follows the assessment process for the Phase 2 Staffing Assessment as described in Reference 3 and endorsed by the NRC in their May 15, 2012, letter to the Nuclear Energy Institute (NEI) (Reference 4). As discussed in Section 3 of the Enclosure, the on-shift staffing analysis concluded that sufficient personnel resources exist in the current BFN on-shift ERO to perform the FLEX Support Instruction tasks and to fill positions for the expanded ERO functions.

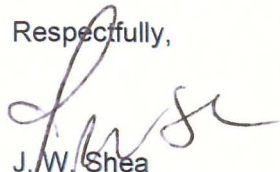
In accordance with Enclosure 1 of Reference 2, the Enclosure of this letter provides the response to the following information requests as related to the Phase 2 Staffing Assessment:

- Reference 1, Enclosure 5, Staffing, Requested Information Item 1
- Reference 1, Enclosure 5, Staffing, Requested Information Item 2
- Reference 1, Enclosure 5, Staffing, Requested Information Item 6

There are no new regulatory commitments resulting from this letter. If you have questions regarding our comments, please contact Beth Wetzel at (423) 751-2403.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 30th day of January 2015.

Respectfully,



J. W. Shea
Vice President, Nuclear Licensing

Enclosure
cc: See Page 3

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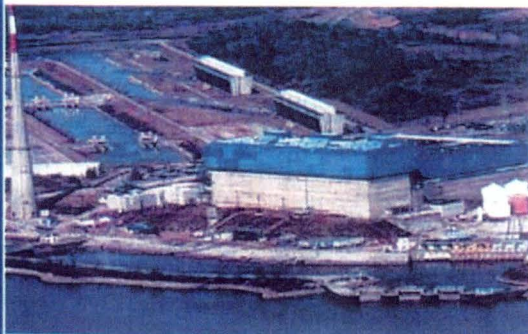
Enclosure: Browns Ferry Nuclear Plant (BFN) NEI 12-01 Phase 2 Extended Loss of AC
Power (ELAP) ERO Staffing Analysis Report

cc:

NRR Director - NRC Headquarters
NRO Director - NRC Headquarters
NRR JLD Director - NRC Headquarters
NRC Regional Administrator - Region II
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ENCLOSURE

BROWNS FERRY NUCLEAR PLANT (BFN)
NEI 12-01 PHASE 2 EXTENDED LOSS OF AC POWER (ELAP)
ERO STAFFING ANALYSIS REPORT



Browns Ferry Nuclear Plant (BFN)

NEI 12-01 Phase 2 Extended Loss of AC Power (ELAP) ERO Staffing Analysis Report

Revision 0
January 23, 2015

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1 **EXECUTIVE SUMMARY**

Using the methodology of (Nuclear Energy Institute) NEI 12-01, Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities, this report presents the results of an assessment of the capability of the Browns Ferry Nuclear (BFN) Plant on-shift staff and augmented Emergency Response Organization (ERO) to respond to a beyond design basis external event (BDBEE). The assumptions for the NEI 12-01 Phase 2 scenario postulate that the BDBEE involves a large-scale external event that results in:

- A. An extended loss of all AC power (ELAP)
- B. An extended loss of ultimate heat sink (UHS)
- C. Impact on all units (all units are in operation at the time of the event)
- D. Impeded access to the units by off-site responders as follows:
 - 0 to 6 Hours Post Event – 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.
 - 6 to 24 Hours Post Event – Limited site access. Individuals may access the site by walking, personal vehicle or via alternate transportation capabilities (e.g., private resource providers or public sector support).
 - 24+ Hours Post Event – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel.

A team of subject matter experts from Operations, Maintenance, Radiation Protection, Chemistry, Security, Emergency Preparedness and industry consultants performed a tabletop evaluation in December 2014 for the on-shift portion of the assessment. The participants reviewed the assumptions and existing procedural guidance, including applicable draft FLEX Support Instructions (FSIs) for coping with a BDBEE using minimum on-shift staffing. Particular attention was given to the sequence and timing of each procedural step, its duration, and the on-shift individual performing the step to account for both the task and time motion analyses of NEI 10-05, Assessment of On-Shift Emergency Response Organization Staffing and Capabilities.

Analysis result items are listed in Section 3.4 and have been entered into the corrective action program.

1.1 **On-shift ERO Analysis**

The on-shift ERO analysis concluded that the current BFN on-shift staffing present for the “no site access” 6-hour time period is sufficient to perform the EOI, FSI and emergency response tasks. However, shift personnel are not yet trained to perform the FSI tasks.

1.2 **Expanded ERO Analysis**

The expanded ERO analysis concluded that the current BFN augmented ERO is sufficient to fill positions for the expanded ERO functions. Thus, the ERO resources and capabilities necessary to implement Transition Phase coping strategies performed after the end of the “no site access” 6-hour time period exist in the current program.

2 INTRODUCTION

In March 2012, the Nuclear Regulatory Commission (NRC) issued a §50.54(f) request for information regarding recommendations from the near-term task force review of insights from the Fukushima Dai-Ichi accident. Information requests related to Emergency Preparedness were contained in Enclosure 5 of the §50.54(f) letter¹. Enclosure 5 contained two requested actions; one involving performance of a staffing assessment and the other a communications assessment. The actions for the staffing assessment are summarized as follows:

It is requested that addressees assess their current staffing levels and determine the appropriate staff to fill all necessary positions for responding to a multi-unit event during a beyond design basis natural event and determine if any enhancements are appropriate given the considerations of Near-Term Task Force (NTTF) Recommendation 9.3².

A two-phased approach was established by the industry to respond to the information requests contained in the §50.54(f) letter associated with staffing. Additionally, NEI developed a technical report (NEI 12-01, Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities) that includes the recommended criteria for use in performing the staffing assessment for a beyond design basis external event. The criteria presented in the NEI 12-01 technical report provide for documenting the organizational capabilities that will facilitate simultaneous performance of accident mitigation and repair actions following a beyond design basis external event.

Note – Use of the term ELAP throughout this report also assumes a loss of the ultimate heat sink as part of the event.

Phase 1 Staffing Assessment

The objective of the Phase 1 staffing assessment was to evaluate the on-site and augmented staff needed to respond to a large-scale external event at a multi-unit site meeting the conditions described in the NEI 12-01 assumptions, NOT including staffing needed to implement actions that address NRC Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (EA-12-049). That is, the Phase 1 staffing assessment considered the requested functions except those related to Order EA-12-049.

The BFN Phase 1 staffing assessment was performed and submitted to the NRC on 4/30/14.

¹ NRC 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 Daiichi Accident, dated March 12, 2012 [ADAMS ML12053A340]

² For background information, refer to NRC staff report entitled, Recommendations for Enhancing Reactor Safety in the 21st Century, dated July 12, 2011 [ADAMS ML111861807 - NTTF report]

Phase 2 Staffing Assessment

Sites with one or more operating units are required to perform a Phase 2 staffing assessment no later than 4 months prior to beginning of the second refueling outage (as used within the context of NRC Order EA-12-049) or December 31, 2016, whichever comes first. In contrast to the Phase 1 staffing assessment, the Phase 2 staffing assessment considers the requested functions related to Order EA-12-049.

The Phase 2 staffing assessment for response functions related to Order EA-12-049 must be based on the actions delineated in the procedures and guidelines developed in response to the Order to ensure accurate results. Once the site-specific actions associated with the new response strategies are defined (i.e., down to the procedure or guideline step level), the staffing needed to perform these actions can be assessed with the necessary level of accuracy.

The results of the Phase 2 assessment have been verified and validated to ensure adequacy and accuracy. In accordance with the requirements of 10 CFR 50, Appendix B, corrective actions and enhancements identified during the assessment are entered into the corrective action program. With regard to this assessment, analysis result items related to ERO staffing that constitute an unsatisfactory result in accordance with the specifications of NEI 10-05 or NEI 12-01 are entered into the corrective action program.

Draft Emergency Operating Instruction (EOI) and FSI documents were used to conduct the staffing assessments. Prior to the BFN implementation date associated with Order EA-12-049 per the current refueling outage schedule, a review of this report will be performed based on the final validated FSIs and any applicable new procedures not available when the staffing table tops were performed. This action item has been entered into the corrective action program. This report will be updated if the staffing assessment results change.

3 PHASE 2 STAFFING ANALYSIS SUMMARY

The on-shift ERO analysis concluded that the current BFN on-shift staffing present for the "no site access" 6-hour time period is sufficient to perform the EOI, FSI and emergency response tasks. However, shift personnel are not yet trained to perform the FSI tasks.

The expanded ERO analysis concluded that the current BFN augmented ERO is sufficient to fill positions for the expanded ERO functions. Thus, the ERO resources and capabilities necessary to implement Transition Phase coping strategies performed after the end of the "no site access" 6-hour time period exist in the current program.

3.1 On-Shift Staffing Task Analysis Results

Refer to Section 6.2, On-Shift Staffing Analysis Results Tables, for documentation of the on-shift staffing task analysis results.

3.1.1 Unassigned Tasks

The task analysis did not identify any unassigned tasks.

3.1.2 Potential Overlap

The task analysis identified one (1) potential task overlap that was performed by on-shift personnel in response to the ELAP event.

- 1) The Shift Manager performed the task of State notification (5/9). Per Table 3.1 of NEI 10-05, Shift Managers that perform the task of State notification are required to have the collective performance of all assigned tasks analyzed and validated by a time motion study.

The Nuclear Security Shift Supervisor (NSSS) and/or other on-shift security personnel perform security contingency plan and EP response tasks (personnel accountability) during an ELAP event. A representative of the BFN Security Department analyzed the EP task assigned to on-shift security individuals. It was concluded that performance of the EP task did not cause an overlap with their tasks related to the Security Plan. Tasks related to the Security Plan are not specifically documented in this analysis due to their security-sensitive nature. No security personnel credited in the Security Plan were assigned tasks associated with the implementation of mitigating strategies during the ELAP event.

3.1.3 Performance Validation

Note – Per NEI 10-05, a validated task is one that has a controlling method (i.e., a program or process) by which the capability to perform the task has been analyzed, such as within the Operations Training Program or the EP Drill Program.

The task analysis did not identify any un-validated EOI or EPIP tasks performed by the on-shift positions.

The task analysis did identify that the performance of FSI tasks are currently not incorporated into the appropriate training program.

3.2 On-Shift Staffing Time Motion Study (TMS) Results

Note – Time motion analysis data was developed during the task analysis using draft FSIs and the informed judgment of the FLEX subject matter experts. In accordance with the methodology provided in NEI 10-05, informed judgment can be used for tasks where directly applicable operating experience is not available and actual timed performance is not practical.

Refer to Section 6.3, ELAP On-Shift Staffing Task Timetable, for the on-shift staffing task timing and sequence analysis results.

3.2.1 Unassigned Tasks

The time motion analysis did not identify any unassigned tasks.

3.2.2 Potential Overlaps Identified as Concurrent Tasks that are not an Overburden

The Shift Manager performed the task of State notification (5/9) while simultaneously performing operations / emergency response oversight tasks and directing initial FLEX alignment actions. The specific activity involved the initial notifications to the State for both the SAE and GE classifications that last 2 minutes for each notification. Follow-up notifications were subsequently turned over to the CECC.

Per NEI 10-05 Section 4, for certain responsibilities it is possible for an ERO position to perform some overlapping tasks without experiencing overload, which is frequently the case for personnel performing those tasks within an operating center.

In these cases, BFN has concluded through formal evaluation that the task of performing State notifications (5/9) does not significantly interfere with performing operations / emergency response oversight tasks and directing initial FLEX alignment actions. The notification task is considered to be equivalent to other tasks categorized as simple and brief communications, and thus does not result in task overload for the Shift Manager.

3.3 Augmented and Expanded ERO Staffing Assessment Results

Refer to Section 7 for details of the expanded ERO functional staffing resources.

The expanded ERO analysis did not identify a shortage of qualified augmented ERO personnel to fill the expanded ERO positions assigned to perform the ELAP functions.

3.4 List of Analysis Results

The following analysis result items that potentially hinder station personnel from performing response tasks in a timely manner have been entered into the corrective action program to document the actions associated with this assessment report:

Analysis Result Items Description
#1: FSI task training/qualification has not yet been developed and incorporated in the applicable departmental training programs.

4 SCOPE OF THE ELAP ERO STAFFING ASSESSMENT

1. Evaluate the ability of the on-shift staff to implement Initial Phase coping actions and, consistent with the site access assumption, evaluate Transition Phase actions that must be performed prior to the end of the “no site access” time period.
 - Initial Phase – Implementation of strategies that generally rely upon installed plant equipment.
 - Transition Phase – Implementation of strategies that involve the use of on-site portable equipment and consumables to extend the coping period, and prevent a loss of functions needed for core cooling, containment, and spent fuel pool cooling. Setup for these strategies may be performed prior to the end of the Initial Phase as determined by procedure.
2. Evaluate the applicable EOI actions and FSI strategies in place at the time of the assessment for the ELAP event.
 - Such actions include the shedding of non-essential battery loads, use of portable generators or batteries, opening room and cabinet doors, water/coolant conservation or makeup using portable equipment, etc.
 - These actions do not include those associated with cross-tying AC power sources or electrical distribution busses between units for multi-unit sites (since all units are assumed affected).
3. Evaluate the draft EOIs and FSIs for responding to an extended loss of AC power affecting both units.
4. Evaluate whether the ability of the on-shift staff to perform any required emergency response functions would be degraded or lost prior to the arrival of the augmented ERO.
5. Consistent with the site access assumption, evaluate the ability of the augmented staff to implement Transition Phase coping strategies performed after the end of the “no site access” time period.

5 ASSUMPTIONS OF THE ELAP ERO STAFFING ASSESSMENT

1. The ELAP event occurs during off-normal work hours at a time when augmented ERO responders are not at the site (e.g., during a backshift, weekend or holiday). This analysis uses 6 hours as the time period to conduct the on-shift ERO response actions. See assumption 13.A below.
2. Only personnel required to be on-shift are credited in the staffing analysis. Interim minimum on-shift staffing reductions allowed by Technical Specifications and/or Technical Requirements Manual are not invoked for the study.
 - NRC LAR approval and SER letter dated 04/25/07 is established as the approved licensing basis for the on-shift staffing complement.
 - TVA-REP Revision 104 Appendix A Figure A-2, Minimum Onshift Personnel, contains the illustration and listing of BFN minimum shift staffing positions.
 - TVA-REP Revision 104 Section 3.2.4 contains the requirement for staffing of the corporate Operations Duty Specialist minimum staffing position.

The minimum shift total is obtained by adding shift staffing positions that do not contain a footnote reference in the far right column.

Functional Area	Major Tasks	Emergency Positions	Analysis Shift Staffing
1. Plant Operations and Assessment of Operational Aspects	Control Room Staff	Shift Manager (SRO) Unit Supervisor (SRO) Unit Operator (UO) Assistant Unit Operator (AUO)	1 3 6 9
2. Emergency Direction and Control	Command and Control	Shift Manager	1 ^(a)
3. Notification & Communication	Licensee ^(b) Local/State Federal	Ops Duty Specialist (ODS) Shift Communicator NRC Phonetalker (AUO)	1 1 ^(a) 1 ^(a)
4. Radiological Assessment	Dose Assessment In-plant Surveys Chemistry	RP Technician RP Technician Chemistry Technician	1 ^(a) 2 1
5. Plant System Engineering, Repair, and Corrective Actions	Technical Support Repair and Corrective Actions	Shift Technical Advisor Mechanical Craftsman Electrician	1 1 1
6. In-Plant PAs	Radiation Protection	RP Technician	2 ^(a)
7. Fire Fighting	--	Incident Commander (WC SRO) Fire Brigade ^(c)	1 5
8. 1 st Aid and Rescue	--	Fire Brigade (as MERT ^(d))	2 ^(a)
9. Site Access Control and Accountability	Security & Accountability	NSSS Security Personnel	1 (e)
TOTAL:			33

- (a) May be filled by someone filling another position having functional qualifications.
- (b) ERO notifications are performed by the corporate Ops Duty Specialist (ODS) which is not a station on-shift ERO position.
- (c) The Fire Brigade consists of 1 Leader and 5 Members (only 4 of which were credited at the time of this analysis) per the Fire Protection Report.
- (d) MERT is staffed by the Fire Brigade as a collateral duty per Fire Protection Report.
- (e) Per BFN Security Plan.

3. On-shift personnel can report to their assigned response locations within timeframes sufficient to allow for performance of assigned actions. The following are the assumed locations of the on shift personnel who perform tasks reviewed as part of this assessment at the time the event is initiated:
 - Shift Manager (SM)..... U1/U2 Control Room
 - U1 Unit Supervisor (US1)..... U1/U2 Control Room
 - U1 Unit Operator #1 (UO1) U1/U2 Control Room
 - U1 Unit Operator #2 (UO2) U1/U2 Control Room
 - U1 Assistant Unit Operator #1 (AUO1).....Control Bay 3C
 - U1 Assistant Unit Operator #2 (AUO2).....Control Bay 3C
 - U2 Unit Supervisor (US2)..... U1/U2 Control Room
 - U2 Unit Operator #1 (UO3) U1/U2 Control Room
 - U2 Unit Operator #2 (UO4) U1/U2 Control Room
 - U2 Assistant Unit Operator #1 (AUO3).....Control Bay 3C
 - U2 Assistant Unit Operator #2 (AUO4).....Control Bay 3C
 - U3 Unit Supervisor (US3)..... U3 Control Room
 - U3 Unit Operator #1 (UO5) U3 Control Room
 - U3 Unit Operator #2 (UO6) U3 Control Room
 - U3 Assistant Unit Operator #1 (AUO5).....Control Bay 3C
 - U3 Assistant Unit Operator #2 (AUO6).....Control Bay 3C
 - Shift Technical Advisor (STA) U1/U2 Control Room
 - Incident Commander (IC)/Work Control Supervisor (WCS)... Work Control Center
 - Outside Operator (AUO #7)Field Office
 - Control Bay Operator (AUO #8)Field Office
 - NRC Phone Talker (AUO #9).....Field Office
 - Mechanical Craftsman Service Building 565
 - Electrician Service Building 565
 - RP Technician #1..... Service Building 565
 - RP Technician #2..... Service Building 565
 - Chemistry TechnicianRWB Chemistry Lab
 - Nuclear Security Shift Supervisor (NSSS)..... Central Alarm Station
 - Fire Brigade Leader (FBL) Maintenance Building 123
 - Fire Brigade Team Member (FBM #1)..... Maintenance Building 123
 - Fire Brigade Team Member (FBM #2)..... Maintenance Building 123
 - Fire Brigade Team Member (FBM #3)..... Maintenance Building 123
 - Fire Brigade Team Member (FBM #4)..... Maintenance Building 123
 - Ops Duty Specialist (ODS).....ODS office in Chattanooga
4. Equipment credited in current coping strategies remains available for use including the FLEX equipment connections and system interfaces.

5. The extended loss of AC power affecting all units assumes the following:
 - Appendix "R" emergency lighting is available during period of power loss.
 - The security emergency diesel generator (EDG) is unavailable.
 - PA is not powered, but sound powered phones are available.
 - Credit for plant radios (Harris Radios) is taken as a means of reliable communications throughout the plant for the first 6 hours.
 - BFN can cross connect batteries to extend plant radio capability by keep the batteries charged.
 - Power operated door locks fail unlocked on loss of power.
 - Satellite phones available for 4 hours.
6. A hostile action directed at the affected site does not occur during the period that the site is responding to the event.
7. The on-shift staff possesses the necessary Radiation Worker qualifications to obtain normal dosimetry and to enter Radiologically Controlled Areas (but not high, locked high or very high radiation areas) without the aid of a RP Technician.
8. The on-site security organization is able to satisfactorily perform tasks related to Site and Protected Area Access Controls. Performance of this function is regularly analyzed through other station programs and will not be evaluated here, unless a role or function from another major response area is assigned as a collateral duty.

The use of Security personnel for any mitigation actions must be in accordance with NEI guidance. (Refer to Attachment 1 Reference #4)
9. Individuals holding the position of RP Technician or Chemistry Technician are qualified to perform the range of tasks expected of their position.
10. The task of making a simple and brief communication has minimal impact on the ability to perform other assigned functions/tasks, and is therefore an acceptable collateral duty for all positions. Examples include making a plant page announcement or placing a call for assistance to an offsite resource such as local law enforcement. This assumption does not apply to emergency notification to an Offsite Response Organization or the NRC.
11. The task of performing a peer check has minimal impact on the ability to perform other assigned functions/tasks, and is therefore an acceptable collateral duty for all positions. Examples include performing a peer check on a recommended emergency classification or notification form for transmittal to offsite authorities.
12. For purposes of assessing augmented staffing, it is assumed that the on-shift staff successfully performs all Initial Phase, and any required Transition Phase, coping actions. Thus, adequate core cooling is maintained throughout the 6 hour duration. No core damage occurs and no entry into Severe Accident Management Guidelines (SAMGs) is required.

13. The event impedes site access as follows:

- A. Post event time: 6 hours – No site access. It is assumed that those Emergency Plan functions performed by the augmented ERO will be delayed for the 6-hour period (e.g., field monitoring).
- 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.

14. All offsite facilities and staging areas are available including those located within the 25 mile telecommunications blackout range.

6 ON-SHIFT ERO RESPONSE CAPABILITY

This section of the assessment documents the ability of the on-shift ERO to implement emergency procedures and coping strategies performed prior to the end of the 6 hour "no site access" time period.

6.1 ELAP Event Description and Initial Conditions

A large-scale external event occurs that results in a loss of off-site power combined with a failure of the emergency and security diesel generators to load. The scope of the event includes the following conditions:

- an extended loss of AC power (ELAP) event occurs
- an extended loss of UHS occurs
- all units are impacted (all units are in operation at the time of the event)
- station access is impeded

Initially, all reactors are operating at full power. Upon the loss of AC power, all three reactors are successfully shut down.

This event results in a Site Area Emergency classification level based on EAL 5.1-S which escalates to a General Emergency classification level based on EAL 5.1-G once it has been determined that power cannot be restored before the coping time will be exceeded (i.e., an ELAP). The scenario is designed such that restoration of any installed (non-FLEX) AC power source is not possible before the arrival of ERO personnel (360 minutes).

Initial Conditions

All units 100% power at equilibrium, end of core life.

Scenario Events

An extreme external event causes an electrical transient resulting in a loss of all offsite power.

None of the non-FLEX EDGs can be synchronized to any Unit 1, Unit 2 or Unit 3 AC bus, resulting in a tri-unit loss of all AC power.

Adequate core cooling is maintained throughout the 6-hour duration. No core damage occurs and no entry into SAMG is required.

No abnormal radiological conditions exist during this event.

Note – refer to Attachment 1 for a list of procedures used to assess the tasks performed during the ELAP scenario.

6.2 On-Shift Staffing Analysis Results Tables

TABLE 1 – On-Shift Positions

Extended Loss of All Power (ELAP)

Line	On-shift Position	Emergency Plan Reference	Augmentation Elapsed Time (min)	Role in Table # / Line#	Unanalyzed Task?	TMS Required?
1.	Shift Manager (SM)	REP App A Figure A-2	N/A	2 / 1 5 / 1 5 / 2 5 / 3 5 / 5 5 / 8 5 / 9	Yes	Yes
2.	Shift Technical Advisor (STA)	REP App A Figure A-2	N/A	2 / 2	No	No
3.	Incident Commander SRO (IC)	REP App A Figure A-2	N/A	2 / 3	Yes	Yes
4.	U1 Unit Supervisor (US1)	REP App A Figure A-2	N/A	2 / 4	No	No
5.	U1 Unit Operator #1 (UO1)	REP App A Figure A-2	N/A	2 / 5	Yes	Yes
6.	U1 Unit Operator #2 (UO2)	REP App A Figure A-2	N/A	2 / 6	No	No
7.	U1 AUO #1 (AUO1)	REP App A Figure A-2	N/A	2 / 7	No	No
8.	U1 AUO #2 (AUO2)	REP App A Figure A-2	N/A	2 / 8	Yes	Yes
9.	U2 Unit Supervisor (US2)	REP App A Figure A-2	N/A	2 / 9	No	No
10.	U2 Unit Operator #1 (UO3)	REP App A Figure A-2	N/A	2 / 10	Yes	Yes
11.	U2 Unit Operator #2 (UO4)	REP App A Figure A-2	N/A	2 / 11	No	No
12.	U2 AUO #1 (AUO3)	REP App A Figure A-2	N/A	2 / 12	No	No
13.	U2 AUO #2 (AUO4)	REP App A Figure A-2	N/A	2 / 13	Yes	Yes
14.	U3 Unit Supervisor (US3)	REP App A Figure A-2	N/A	2 / 14	No	No
15.	U3 Unit Operator #1 (UO5)	REP App A Figure A-2	N/A	2 / 15	No	No
16.	U3 Unit Operator #2 (UO6)	REP App A Figure A-2	N/A	2 / 16	No	No
17.	U3 AUO #1 (AUO5)	REP App A Figure A-2	N/A	2 / 17	No	No
18.	U3 AUO #2 (AUO6)	REP App A Figure A-2	N/A	2 / 18	No	No
19.	AUO – Outside (AUO7)	REP App A Figure A-2	N/A	2 / 19	Yes	Yes
20.	AUO – Control Bay (AUO8)	REP App A Figure A-2	N/A	2 / 20	Yes	Yes
21.	NRC Phone Talker (AUO9)	REP App A Figure A-2	N/A	5 / 10 5 / 13	No	No
22.	Mechanical Craftsman (Mech)	REP App A Figure A-2	N/A	2 / 22	Yes	Yes
23.	Electrician (Elect)	REP App A Figure A-2	N/A	2 / 23	Yes	Yes
24.	FBL (FB1)	Fire Protection Report	N/A	2 / 24	Yes	Yes
25.	FB#1 (FB2)	Fire Protection Report	N/A	2 / 25	Yes	Yes

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Line	On-shift Position	Emergency Plan Reference	Augmentation Elapsed Time (min)	Role in Table # / Line#	Unanalyzed Task?	TMS Required?
26.	FB#2 (FB3)	Fire Protection Report	N/A	2 / 26	Yes	Yes
27.	FB#3 (FB4)	Fire Protection Report	N/A	2 / 27	Yes	Yes
28.	FB#4 (FB5)	Fire Protection Report	N/A	2 / 28	Yes	Yes
29.	RP Technician #1 (RP1)	REP App A Figure A-2	N/A	2 / 29 4 / 4	Yes	Yes
30.	RP Technician #2 (RP2)	REP App A Figure A-2	N/A	2 / 30 4 / 4	Yes	Yes
31.	Chemistry Technician (CT)	REP App A Figure A-2	N/A	2 / 31	Yes	Yes
32.	Security Watch Commander (SWC)	Security Plan	N/A	5 / 15	No	No
33.	Ops Duty Specialist (ODS)	TVA-REP Section 3.2.4	N/A	5 / 6 5 / 11	No	No

Note: NEI 10-05 requirements for Time Motion Study analysis following the identification of potential task overlap are satisfied by evaluating the timing and duration of the activities by subject matter experts during the task analysis table top. See Section 3.2.

TABLE 2 – Plant Operations & Safe Shutdown

Extended Loss of All Power (ELAP)

Minimum Crew (Three Units – Two Control Rooms)

Line	Generic Title/Role	On-Shift Position	Task Description	Controlling Method
1.	Shift Manager	Shift Manager (SM)	Plant and crew oversight Direct AUO4 and 6 to investigate status of EDGs Contact PSO for grid status 0-GOI-300-4, 0-AOI-57-1A	Ops Training Program
2.	Shift Technical Advisor	Shift Technical Advisor (STA)	Perform STA tasks	Ops Training Program
3.	Other	Incident Cmd SRO (IC)	Perform ELAP evaluation (0-FSI-1) Declare ELAP (0-FSI-1) Implement DC load shed (0-FSI-3F) Direct SSM to implement security-specific actions for loss of all ac power – Implemented via SSI SSI-7.7, SSI-16.1 Recall FSI support team to CR (0-FSI-0.0) Direct AUO8 to perform visual assessment site conditions (0-FSI-6A) Determine FLEX equipment deployment strategy (0-FSI-6A) Direct deployment of 480V generator (0-FSI-3A) Direct deployment of FLEX pumps (0-FSI-2A) Direct hook up FPS #1 to internal components (0-FSI-2E) Direct temp lighting, ventilation & comms – includes cross-connect radio batteries (0-FSI-4A)	N/V – None in place
4.	Unit Supervisor	U1 Unit Supervisor (US1)	Direct Rx Scram immediate actions (EOI-1) Direct UO2 to maintain RPV pressure and level control (EOI App 11A / EOI-5C) Enter Station Blackout (0-AOI-57-1A) Direct AUO1 to perform trip/isolation defeat (EOI App 16A, 16B, 16E, 16H, 16M, 20M) Direct cooldown (0-AOI-57-1A) Direct UO1 to perform PCIV isolation (0-AOI-57-1A) Direct UO1 to perform SFP heatup rate calcs (0-AOI-78-1) Direct AUO6 to vent H2 from all generators (OI-35) Direct AUO2 to connect backup N2 for extended SRV operation (1 EOI, App 20H)	Ops Training Program
5.	Reactor Operator #1	U1 Unit Operator #1 (UO1)	Perform Rx Scram immediate actions (EOI-1) Perform PCIV isolation (0-AOI-57-1A) Perform SFP heatup calcs (0-AOI-78-1) Continue with CR Actions (0-AOI-57-1A) Perform temp lighting, ventilation & comms – includes cross-connect radio batteries (0-FSI-4A)	Ops Training Program N/V – None in place

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Line	Generic Title/Role	On-Shift Position	Task Description	Controlling Method
6.	Reactor Operator #2	U1 Unit Operator #2 (UO2)	Perform Rx Scram immediate actions (EOI-1) Maintain RPV pressure and level control (EOI App 11A / EOI-5C) Perform CR actions to cooldown (0-AOI-57-1A)	Ops Training Program
7.	Auxiliary Operator #1	U1 AUO #1 (AUO1)	Perform Unit trip/isolation defeat (EOI App 16A, 16B, 16E, 16H, 16M, 20M)	Ops Training Program
8.	Auxiliary Operator #2	U1 AUO #2 (AUO2)	Connect backup N2 for extended SRV operation (1/2/3 EOI, App 20H) Hook up FPS #1 to internal components (0-FSI-2E – Unit specific Attachments)	Ops Training Program N/V – None in place
9.	Other	U2 Unit Supervisor (US2)	Direct Rx Scram immediate actions (EOI-1) Direct UO4 to maintain RPV pressure and level control (EOI App 11A / EOI-5C) Enter Station Blackout (0-AOI-57-1A) Direct AUO3 to perform trip/isolation defeat (EOI App 16A, 16B, 16E, 16H, 16M, 20M) Direct cooldown (0-AOI-57-1A) Direct UO3 to perform PCIV isolation (0-AOI-57-1A) Direct UO3 to perform SFP heatup rate calcs (0-AOI-78-1) Direct AUO4 to connect backup N2 for extended SRV operation (2 EOI, App 20H)	Ops Training Program
10.	Reactor Operator #3	U2 Unit Operator #1 (UO3)	Perform Rx Scram immediate actions (EOI-1) Perform PCIV isolation (0-AOI-57-1A) Perform SFP heatup calcs (0-AOI-78-1) Continue with CR Actions (0-AOI-57-1A) Perform temp lighting, ventilation & comms – includes cross-connect radio batteries (0-FSI-4A)	Ops Training Program N/V – None in place
11.	Reactor Operator #4	U2 Unit Operator #2 (UO4)	Perform Rx Scram immediate actions (EOI-1) Maintain RPV pressure and level control (EOI App 11A / EOI-5C) Perform CR actions to cooldown (0-AOI-57-1A)	Ops Training Program
12.	Auxiliary Operator #3	U2 AUO #1 (AUO3)	Perform Unit trip/isolation defeat (EOI App 16A, 16B, 16E, 16H, 16M, 20M)	Ops Training Program
13.	Auxiliary Operator #4	U2 AUO #2 (AUO4)	Investigate status of EDGs and report Connect backup N2 for extended SRV operation (1/2/3 EOI, App 20H) Hook up FPS #1 to internal components (0-FSI-2E – Unit specific Attachments)	Ops Training Program N/V – None in place

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Line	Generic Title/Role	On-Shift Position	Task Description	Controlling Method
14.	Other	U3 Unit Supervisor (US3)	Direct Rx Scram immediate actions (EOI-1) Direct UO2 to maintain RPV pressure and level control (EOI App 11A / EOI-5C) Enter Station Blackout (0-AOI-57-1A) Direct AUO5 to perform trip/isolation defeat (EOI App 16A, 16B, 16E, 16H, 16M, 20M) Direct cooldown (0-AOI-57-1A) Direct UO5 to perform PCIV isolation (0-AOI-57-1A) Direct UO5 to perform SFP heatup rate calcs (0-AOI-78-1) Direct AUO6 to connect backup N2 for extended SRV operation (3 EOI, App 20H)	Ops Training Program
15.	Other	U3 Unit Operator #1 (UO5)	Perform Rx Scram immediate actions (EOI-1) Perform PCIV isolation (0-AOI-57-1A) Perform SFP heatup calcs (0-AOI-78-1) Continue with CR Actions (0-AOI-57-1A)	Ops Training Program
16.	Other	U3 Unit Operator #2 (UO6)	Perform Rx Scram immediate actions (EOI-1) Maintain RPV pressure and level control (EOI App 11A / EOI-5C) Perform CR actions to cooldown (0-AOI-57-1A)	Ops Training Program
17.	Other	U3 AUO #1 (AUO5)	Perform Unit trip/isolation defeat (EOI App 16A, 16B, 16E, 16H, 16M, 20M)	Ops Training Program
18.	Other	U3 AUO #2 (AUO6)	Investigate status of EDGs and report Vent H2 from all unit main generators (OI-35) Connect backup N2 for extended SRV operation (1/2/3 EOI, App 20H)	Ops Training Program
19.	Other	AUO – Outside (AUO7)	Perform control bay actions (0-FSI-3F)	N/V – None in place
20.	Other	AUO – Control Bay (AUO8)	Perform visual assessment of site conditions (0-FSI-6A) Deploy cables for 480V generator connections (0-FSI-3A) Finalize connections and installation of 480V generator (0-FSI-3A))	N/V – None in place
21.	Other	NRC Phone Talker (AUO9)	N/A	N/A

Other (non-Operations) Personnel

Line	Generic Title/Role	On-Shift Position	Task Description	Controlling Method
22.	Mechanic	Mechanical Craftsman (Mech)	Deploy and set hoses for FLEX pumps (0-FSI-2A) Deploy FLEX pumps from FESB to pad 0-FSI-2A) Connect / start FLEX pumps – EECW / RHRSW for RPV and SFP makeup (0-FSI-2A)	N/V – None in place
23.	Electrician	Electrician (Elect)	Deploy cables for 480V generator connections (0-FSI-3A) Finalize connections and installation of 480V generator 0-FSI-3A)	N/V – None in place
24.	Other	FBL (FB1)	Deploy 480V generator from FESB to pad (0-FSI-3A) Finalize connections and installation of 480V generator (0-FSI-3A)	N/V – None in place
25.	Other	FB#1 (FB2)	Deploy and set hoses for FLEX pumps (0-FSI-2A) Deploy FLEX pumps from FESB to pad 0-FSI-2A) Connect / start FLEX pumps – EECW / RHRSW for RPV and SFP makeup (0-FSI-2A)	N/V – None in place
26.	Other	FB#2 (FB3)	Deploy and set hoses for FLEX pumps (0-FSI-2A) Deploy FLEX pumps from FESB to pad (0-FSI-2A) Connect / start FLEX pumps – EECW / RHRSW for RPV and SFP makeup (0-FSI-2A)	N/V – None in place
27.	Other	FB#3 (FB4)	Deploy and set hoses for FLEX pumps (0-FSI-2A) Deploy FLEX pumps from FESB to pad (0-FSI-2A) Connect / start FLEX pumps – EECW / RHRSW for RPV and SFP makeup (0-FSI-2A)	N/V – None in place
28.	Other	FB#4 (FB5)	Initiate debris removal for 480V generator deployment (0-FSI-6A) Deploy and set hoses for FLEX pumps (0-FSI-2A) Deploy FLEX pumps from FESB to pad (0-FSI-2A) Connect / start FLEX pumps – EECW / RHRSW for RPV and SFP makeup (0-FSI-2A)	N/V – None in place
29.	Other	RP Technician #1 (RP1)	Hook up FPS #1 to internal components (0-FSI-2E – Unit specific Attachments)	N/V – None in place
30.	Other	RP Technician #2 (RP2)	Hook up FPS #1 to internal components (0-FSI-2E – Unit specific Attachments)	N/V – None in place
31.	Other	Chemistry Technician (CT)	Deploy 480V generator from FESB to pad (0-FSI-3A) Finalize connections and installation of 480V generator (0-FSI-3A)	N/V – None in place

Analysis Result Item #1: FSI task training/qualification has not yet been developed and incorporated in the applicable departmental training programs.

TABLE 3 – Firefighting

Extended Loss of All Power (ELAP)

Line	Performed By	Task Description	Controlling Method
1.	Fire Brigade Leader	N/A	N/A
2.	FB Member #1	N/A	N/A
3.	FB Member #2	N/A	N/A
4.	FB Member #3	N/A	N/A
5.	FB Member #4	N/A	N/A

TABLE 4 – Radiation Protection and Chemistry

Extended Loss of All Power (ELAP)

#	Position Performing Function/Task	Performance Time Period After Emergency Declaration (minutes)										
		0-30	30-60	60-90	90-120	120-150	150-180	180-210	210-240	240-300	300-330	330-360
1.	In-Plant Survey On-Shift Position:											
2.	On-Site Radiological Survey On-Shift Position:											
3.	Personnel Monitoring On-Shift Position:											
4.	Job Coverage On-Shift Position: RP1/RP2 FSI Job Coverage		X	X	X	X	X					
5.	Offsite Radiological Assessment On-Shift Position:											
6.	Other HP – Describe: On-Shift Position:											
7.	Sampling On-Shift Position:											
8.	Other Chem – Describe: On-Shift Position:											

TABLE 5 – Emergency Plan Implementation

Extended Loss of All Power (ELAP)

Line	Function/Task	On-Shift Position	Controlling Method
1.	Declare the Emergency Classification Level (ECL)	Shift Manager	EPDP-3 Att. 2 Obj. A.1, D.1, D.2
2.	Approve Offsite Protective Action Recommendations	Shift Manager	EPDP-3 Att. 2 Obj. A.1
3.	Approve content of State/local notifications	Shift Manager	EPDP-3 Att. 2 Obj. A.1
4.	Approve extension to allowable dose limits	N/A	N/A
5.	Notification and direction to on-shift staff (e.g., to assemble, evacuate, etc.)	Shift Manager	EPDP-3 Att. 2 Obj. B.1, B.2, B.3, E.1
6.	ERO notification	ODS	EPDP-3 Att. 2 Obj. A.26
7.	Abbreviated NRC notification for design basis threat (DBT) event	N/A for ELAP	N/A
8.	Complete State/local notification form	Shift Manager	EPDP-3 Att. 2 Obj. A.1
9.	Perform State/local notifications	Shift Manager/ODS	EPDP-3 Att. 2 Obj. A.1 / A.26
10.	Complete NRC event notification form	Shift Manager	EPDP-3 Att. 2 Obj. E.4
11.	Activate Emergency Response Data System (ERDS)	ODS	EPDP-3 Att. 2 Obj. A.26
12.	Offsite radiological assessment	N/A	Not performed by shift during ELAP event scenario
13.	Perform NRC notifications	AUO9	EPDP-3 Att. 2 Obj. E.4
14.	Perform other site-specific event notifications (e. g., Institute of Nuclear Power Operations (INPO), American Nuclear Insurers (ANI), etc.)	N/A	N/A
15.	Personnel accountability	SCM	EPDP-3 Att. 2 Obj. J.3

Notes:

Line #6 – The ERO notification process involves a brief communication from the SM to the Ops Duty Specialist (ODS), who activates the ERO notification system for the appropriate station. The ODS is not a station ERO minimum staff shift position.

Line #11 – ERDS is in continuous operation for each TVA station and cannot be operated locally from the stations. The ERDS activation process involves a brief communication from the SM to the Ops Duty Specialist (ODS), who initiates the ERDS communications to the NRC for the appropriate station. The ODS is not a station ERO minimum staff shift position.

6.3 ELAP On-Shift Staffing Task Timetable

Time (T+mins)	Position(s)	Action	Duration (min)
0	Complete loss of station AC power event occurs		
1	US1 US2 US3	Direct Rx Scram immediate actions (EOI-1)	1
1	UO1 UO2 UO3 UO4 UO5 UO6	Perform Rx Scram immediate actions (EOI-1)	1
2	US1 US2 US3	Direct UO2, 4 and 6 to maintain RPV pressure and level control (EOI App 11A / EOI-5C)	1
3	UO2 UO4 UO6	Maintain RPV pressure and level control (EOI App 11A / EOI-5C)	Duration
4	US1 US2 US3	Enter Station Blackout – Initiated by report of loss of AC power from UOs (0-AOI-57-1A)	Duration
5	US1 US2 US3	Direct AUO1, 3 and 5 – done via radio if personnel are not in CR – to perform trip/isolation defeat (EOI App 16A, 16B, 16E, 16H, 16M, 20M)	1
6	AUO1 AUO3 AUO5	Perform Unit trip/isolation defeat (EOI App 16A, 16B, 16E, 16H, 16M, 20M)	45
6	US1 US2 US3	Direct cooldown (0-AOI-57-1A)	1
6	IC	Report to CR	
6	IC	Perform ELAP evaluation (0-FSI-1)	2
7	UO2 UO4 UO6	Perform CR actions to cooldown (0-AOI-57-1A)	90
7	US1 US2 US3	Direct UO1, UO3 and UO5 to perform PCIV isolation (0-AOI-57-1A)	1
8	UO1 UO3 UO5	Perform PCIV isolation (0-AOI-57-1A)	1
8	IC	Declare ELAP (0-FSI-1)	1
8	US1 US2 US3	Direct UO1, UO3 and UO5 to perform SFP heatup rate calcs (0-AOI-78-1)	1
9	UO1 UO3 UO5	Perform SFP heatup calcs (0-AOI-78-1)	5
9	IC	Implement DC load shed (0-FSI-3F)	1
10	AUO2 AUO4 AUO6 AUO7 AUO8 AUO9	Report to CR	

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Time (T+mins)	Position(s)	Action	Duration (min)
10	SM	Direct AUO4 and 6 to investigate status of EDGs	1
10	IC	Direct AUO7 to perform 250V load shed (0-FSI-3F)	1
11	SM	Determine and declare SAE Classification (EPIP-4)	2
11	AUO4 AUO6	Investigate status of EDGs and report	20
11	AUO7	Perform control bay actions (0-FSI-3F)	30
12	IC	Direct SSM to implement security-specific actions for loss of all ac power – Implemented via security contingency plans SSI-7.6, SSI-16.1	1
12	STA	Perform STA tasks	Duration
13	SM	Notification and direction to on-shift staff (EPIP-4)	Duration
13	SWC	Perform actions for security force for loss of AC (SCP)	20
14	SM	Complete initial SAE state notification form (EPIP-4, App A)	1
14	UO1 UO3 UO5	Continue with CR Actions (0-AOI-57-1A) (Additional UO actions)	27
14	IC	Recall FSI support team to CR (0-FSI-0.0)	1
15	SM	Approve content of initial SAE state notification form (EPIP-4, App A)	1
16	SM	Perform initial SAE state notification (EPIP-4, App B)	2
18	SM	Perform notifications of onsite / TVA personnel (EPIP-4, App D)	1
19	ODS	Perform ERO callout (CECC-EPIP-3)	1
19	RP1 RP2 Elect Mech Chem FBL FB	Report to CR	
19	IC	Direct AUO8 to perform visual assessment site conditions (0-FSI-6A)	1
20	ODS	Perform activation of ERDS (CECC-EPIP-3)	1
20	SM	Contact PSO for grid status 0-GOI-300-4, 0-AOI-57-1A	2
20	AUO8	Perform visual assessment of site conditions (0-FSI-6A)	10
25	SM	Direct Security to implement Accountability	1
26	SWC	Perform Accountability (Ad Hoc)	Ad Hoc
27	AUO9	Complete ENS Notification Form (EPIP-4, App C)	1
28	AUO9	Perform ENS Notification (EPIP-4, App C)	Duration
30	AUO8	Return to CR and report	
31	AUO4 AUO6	Return to CR	
31	IC	Determine FLEX equipment deployment strategy (0-FSI-6A)	3
33	SM	Determine and declare GE Classification (EPIP-1)	2
34	IC	Direct deployment of 480V generator (0-FSI-3A)	1
35	AUO8 Elect	Deploy cables for 480V generator connections (0-FSI-3A)	240
35	FB5	Initiate debris removal for 480V generator deployment (0-FSI-6A)	120
35	FB1 Chem	Deploy 480V generator from FESB to pad (0-FSI-3A)	240
35	SM	Complete PAR (EPIP-5, App A)	1
36	IC	Direct deployment of FLEX pumps (0-FSI-2A)	1
36	SM	Complete initial GE state notification form (EPIP-5, App A)	1

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Time (T+mins)	Position(s)	Action	Duration (min)
37	FB2 FB3 FB4 Mech	Deploy and set hoses for FLEX pumps (0-FSI-2A)	180
37	SM	Approve content of initial GE state notification form (EPIP-5, App A)	1
38	IC	Direct hook up FPS #1 to internal components (0-FSI-2E)	1
38	SM	Perform initial GE state notification (EPIP-5, App C)	2
39	AUO2 AUO4 RP1 RP2	AUO2 & AUO4 hook up FPS #1 to internal components (0-FSI-2E – Unit specific Attachments). RP1 & RP2 provide job coverage.	180
40	IC	Direct temp lighting, ventilation & comms – includes cross-connect radio batteries (0-FSI-4A)	1
40	SM	Perform notifications of onsite / TVA personnel (EPIP-5, App B)	1
41	UO1 UO3	Perform temp lighting, ventilation & comms – includes cross-connect radio batteries (0-FSI-4A)	Duration
41	AUO7	Return to CR	
51	AUO1 AUO3 AUO5	Return to CR	
60	SM	Turnover of offsite communications to CECC	
64	US1	Direct AUO6 to vent H2 from all generators (OI-35)	1
65	AUO6	Vent H2 from all unit main generators (OI-35)	60
65	CECC	Complete follow-up GE notification form (EPIP-5, App A)	2
67	CECC	Approve content of follow-up GE notification form (EPIP-5, App A)	1
68	CECC	Perform follow-up GE notification (EPIP-5, App C)	4
97	First cooldown complete at 200 - 250 psi		
125	AUO6	Return to CR	
130	CECC	Complete follow-up GE notification form (EPIP-5, App A)	2
132	CECC	Approve content of follow-up GE notification form (EPIP-5, App A)	1
133	CECC	Perform follow-up GE notification (EPIP-5, App C)	4
155	FB5	Return to CR	
160	FB5	Deploy and set hoses for FLEX pumps (0-FSI-2A)	57
195	CECC	Complete follow-up GE notification form (EPIP-5, App A)	
197	CECC	Approve content of follow-up GE notification form (EPIP-5, App A)	1
198	CECC	Perform follow-up GE notification (EPIP-5, App C)	4
217	FB2 FB3 FB4 FB5 Mech	Deploy FLEX pumps from FESB to pad (0-FSI-2A)	120
219	AUO2 AUO4 RP1 RP2	Return to CR	
220	US1 US2 US3	Direct AUO2, 4 and 6 to connect backup N2 for extended SRV operation (1/2/3 EOI, App 20H)	1
221	AUO2 AUO4 AUO6	Connect backup N2 for extended SRV operation (1/2/3 EOI, App 20H)	30
251	AUO2 AUO4 AUO6	Return to CR	

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Time (T+mins)	Position(s)	Action	Duration (min)
255	CECC	Complete follow-up GE notification form (EPIP-5, App A)	2
257	CECC	Approve content of follow-up GE notification form (EPIP-5, App A)	1
258	CECC	Perform follow-up GE notification (EPIP-5, App C)	4
275	AUO8 Elect FB1 Chem	Finalize connections and installation of 480V generator (0-FSI-3A)	85
315	CECC	Complete follow-up GE notification form (EPIP-5, App A)	2
317	CECC	Approve content of follow-up GE notification form (EPIP-5, App A)	1
318	CECC	Perform follow-up GE notification (EPIP-5, App C)	4
337	FB2 FB3 FB4 FB5 Mech	Connect / start FLEX pumps – EECW / RHRSW for RPV and SFP makeup (0-FSI-2A)	60
360	Battery chargers 1A, 2A, 2B and 3A supplying power.		
360	AUO8 Elect FB1 Chem	Return to CR	
360	End of Shift Staffing Task Sequence Analysis		

7 AUGMENTED AND EXPANDED ERO RESPONSE CAPABILITY

This section of the assessment documents the ability of the augmented and expanded ERO to implement Transition Phase coping strategies performed after the end of the 6 hour "no site access" time period. The expanded ERO is defined as the required augmented ERO for a multi-unit event.

7.1 ERO Notification and Response during an ELAP

Assessment of staffing resources for the expanded ERO is provided by the depth of personnel filling the existing augmented ERO positions. Table 7-1 below documents the required site augmented (non on-shift) ERO staffing positions from Table A-1 of NP-REP Appendix A. The recommended depth for each augmented ERO minimum and full staffing positions is 4 per NPG-SPP-18.3, Emergency Preparedness. The number qualified is based on the BFN ERO Qualification Rosters dated 01/09/15.

Table 7-1 Site Emergency Organization

	ERO Title	# Required	# Qualified
TSC	Site Emergency Director	1	3
	RP Manager	1	4
	Asst. RP Manager	1	4
	TSC Clerk	1	8
	TSC Boardwriter	1	8
	EP Manager	1	5
	Maintenance Manager	1	3
	Nuclear Security Manager	1	32
	Technical Assessment Manager	1	8
	Technical Assessment Team Leader	1	8
	TAT Thermal Hydraulic Engineer	1	10
	TAT Electrical Engineer	1	7
	TAT TSC Communicator	1	7
	TAT Mechanical Engineer	1	7
	Chemistry Manager	1	8
	NRC Coordinator	1	4
	Operations Manager	1	4
	Operations Communicator	1	5
OSC/Staging Area	OSC Manager	1	3
	OSC Assistant Manager	1	5
	RP Supervisor	1	7
	RP Technicians	14	40
	Maintenance Planner	1	25
	Operations Briefer	1	4
	Material Coordinator	1	9
	Clerk	1	4
	Fire Protection Briefer	1	4
	Electrical Briefer	1	10
	Electricians	3	92
	Chemistry Briefer	1	5
	Chemistry Technician	1	15
	Mechanical Briefer	1	8
	Mechanical Craft	2	96
	I&C Briefer	1	10
	I&C Craft	1	67
	Staging Area Manager	1	8

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	ERO Title	# Required	# Qualified
	Status Board Writer	1	15
	Document Control	1	3
	Team Coordinator	1	6
CR	Control Room Communicator	1	11
	Totals	54	582

7.1.1 General ERO Response

1. Implementing Strategy for the Expanded ERO

The ERO augmentation process consists of an "all call/all come" expectation. When the ERO notification systems are operable, the qualified ERO members are contacted and expected to report if fit for duty.

When the normal ERO notifications systems are not operable NPG-SPP-18.3, Emergency Preparedness, includes the following statement under ERO Expectations:

During events that would impact the safe operation of a NPG site (BFN, SQN, or WBN) or large scale disasters (earthquakes, tornados, or regional blackout), when the ERO has not been activated and area communications (pagers, cell towers, internet, land line phone systems) are being challenged or are not working, NPG ERO personnel are expected to report to their Emergency Response Facility if they cannot contact the plant for additional guidance.

This requirement and expectation was communicated to augmented ERO personnel as well as on-shift ERO personnel (off-duty Operations and Security personnel, and craft personnel) via EP News Letter, e-mail and Electronic Read training for the TVA fleet.

Review of the BFN ERO roster confirmed that sufficient numbers of qualified individuals are available to fill the positions in Table 7.2 with adequate depth to staff at least two 12-hour shifts.

2. Response Timeliness for the Expanded ERO

The BFN ERO augmentation process consists of an "all call/all come" expectation. Callout of an expanded ERO is subsumed within the callout of the augmented ERO per NPG-SPP-18.3, Emergency Preparedness.

In the absence of the call out system, ERO members are trained to respond automatically per NPG-SPP-18.3 as described in the implementing strategy above.

3. Work Location for the Expanded ERO

If access to the primary emergency response facilities is not possible, ERO members are trained to report to their alternate location at the Muscle Shoals Facility.

4. Transportation for the Expanded ERO

In Tennessee Valley Authority letter to the NRC dated June 11, 2012, Ninety-Day Response to Recommendation 9.3 of 10 CFR 50.54(f) Request for Information, BFN stated that the following methods of access to the site are available:

Roadway - There are three (3) directions into the BFN:

- From Athens/Huntsville/Decatur - Highway 31 onto Nuclear Plant Road into BFN
- From Athens - State Route 72 to Browns Ferry Road turn right onto Nuclear Plant Road into BFN
- From Florence - State Route 72 to Shaw Road into BFN

Air – Access to BFN can be provided from staging areas and landing zones via helicopters owned by TVA.

Water – BFN can be accessed from the Tennessee River. The Tennessee River can be accessed from multiple access points.

5. ERO Drill & Exercise Program

NEI 12-01 states that a licensee should determine if any changes are necessary to documents describing the emergency response drill and exercise program. In particular, standard objectives and extent-of-play may need to be revised to clarify the expected demonstration of functions that are dependent upon the type of scenario event or accident (i.e., within or beyond design basis, and number of affected units). For example, functions associated with an expanded response capability would not be demonstrated during a drill or exercise that involved a design basis accident affecting only one unit.

Current BFN drill and exercise procedures include evaluation objectives and demonstration criteria for dual unit events and expanded ERO activities. As future guidance is expected from the NRC in this area, no further changes are necessary to the drill and exercise procedures at this time.

7.1.2 Position Specific ERO Response

1. Radiation Protection Technicians (RPTs)

The equation below was used to determine the required number of on-site RP Technicians (on-shift plus augmented ERO RP Technicians that perform on-site response functions) for BFN:

$$RPT_{TOTAL} = RPT_{COP} + RPT_{SHIFT} + RPT_{RCA} + RPT_{NC}$$

Where:

RPT_T = Total required number of on-site RP Technicians.

RPT_{COP} = Number needed to support implementation of the 2 most limiting ELAP FLEX strategies.

RPT_{SHIFT} = Number needed to fill on shift complement.

RPT_{RCA} = Number needed for repair and corrective action (x the number of units).

RPT_{NC} = Number of on-site RP Technicians performing other emergency plan functions that would preclude them from performing job coverage for extended loss of all AC power coping, repair or corrective action teams.

For BFN, the resulting number of RPTs is:

<u>RPT Category</u>	<u>Number Required</u>	<u>Comments</u>
RPT_{COP}	0	Staffing assessment results indicate that 0 RPTs are needed to support implementation of the 2 most radiologically limiting ELAP FLEX strategies (see Section 7.1.2.3).
RPT_{SHIFT}	2	Minimum # of BFN on-shift RPTs.
RPT_{RCA}	6	Minimum # of BFN RPTs required for ERO augmentation response for in-plant RP protective action function (2 x 3 = 6).
RPT_{NC}	6	Minimum # of BFN RPTs required for ERO augmentation response for radiological assessment function.
RPT_T	14	

Thus, the total number of on-site RPTs required for the expanded ERO is 28 which is based on the staffing needed to:

- 1) Support the two most limiting RP resource intense FSIs which do not require rotating shifts (0 RPT_{COP})
- 2) Support operating on 12-hour shifts for other RP tasks (2 shifts of RPT_{RCA} , RPT_{SHIFT} and RPT_{NC} = 28 total RPTs).

40 RPTs are available to support performance of assigned emergency plan functions and the expanded response capability (refer to Table 7-1).

Provisions exist for obtaining additional RPT resources from other stations within the TVA fleet and/ or within the industry (i.e., INPO Emergency Resource Manual).

2. Administrative Support Personnel

NEI 12-01 states that a licensee should determine if current assignments and locations of administrative support personnel are adequate for implementation of the expanded response capability, and identify necessary changes.

The administrative support personnel who assist the augmented ERO members are not assigned critical response tasks. Augmented ERO personnel are capable of performing their assigned tasks and responsibilities without requiring administrative support.

3. FSI Implementers

The assessment considered the number of personnel required for simultaneous implementation of the two FSI strategies for each unit that require the greatest number of staff to implement. There are five (5) FSI strategies for the site:

- 1) Maintain Instrumentation
- 2) Decay Heat Removal
- 3) RCS Injection
- 4) Containment Integrity
- 5) Spent Fuel Pool (SFP) Makeup & Cooling

Based on the FSI task analysis, the following two FLEX strategies have been selected:

- Strategy #2 – Decay Heat Removal or #3 – RCS Injection
- Strategy #5 – SFP Makeup & Cooling

Implementation of Strategy #2 or #3 requires FSIs to be implemented, and will require the following personnel resources:

Strategy #2 – Decay Heat Removal or #3 or RCS Injection

Implementation of Strategy #2 or #3 involves the following FSIs and personnel resources:

- 0-FSI-2A
- 0-FSI-3A
- 0-FSI-2E
- 1/2/3-EOI Appendix 20B

Personnel (department)	Total # (3 Units)	Task Performed
UO	3	Control room actions for RPV injection
AUO	1	Remove battery charger(s) from service

Strategy #5 – SFP Makeup & Cooling

Implementation of Strategy #5 involves the following FSIs and personnel resources:

- 0-FSI-2A
- 1/2/3-EOI Appendix E

Personnel (department)	Total # (3 Units)	Task Performed
UO	3	Control room actions
AUO	3	In plant valve operations

A total of 10 personnel are required to simultaneously implement these two FLEX strategies on both units.

7.2 Expanded Response Functions for Phase 2 Staffing Assessment

Table 7-2a addresses NEI 12-01 Table 3.1, less SAMG implementation, and documents the staffing necessary to support the simultaneous deployment of emergency repair and corrective action teams to each affected unit. The overall responsibility for the site response will be maintained by a single Site Emergency Director. This individual will provide overall command & control to the augmented ERO for the site and allow for an integrated site response. The augmented ERO positions of TSC Operations Manager & TSC Technical Manager will also be staffed by a single individual for the site. The Operations Manager will coordinate with the Operations Shift Manager & the three (3) Unit Supervisors to manage the response to a BDBEE. The TSC Technical Manager will coordinate the overall response of the Technical Assessment Teams for each unit in order to support 24-hour expanded ERO staffing based on 12-hour shifts. Implementation of the two most limiting FSI tasks (last row) does not require 24-hour coverage. The number available column is the number of personnel qualified to the position.

Table 7-2a Expanded vs. Augmented ERO Response Comparison

Function	Location	Key Roles & Staffing Considerations	BFN ERO Position	# Required U1/U2/U3	# Available U1/U2/U3
Unit Response Coordination	TSC	<ul style="list-style-type: none"> Overall cognizance of the activities related to implementation of repair and corrective actions and implementation of Transition Phase coping and Severe Accident Management (SAM) strategies for an assigned unit. One individual per unit; individuals should not be assigned other functions. 	Site Emergency Director	2	4
Operations Coordination	TSC	<ul style="list-style-type: none"> Provides coordination of Operations staff and support for an assigned unit. One individual per unit; individuals should not be assigned other functions. 	Operations Manager	2	3
Maintenance Coordination	TSC / OSC	<ul style="list-style-type: none"> Provides coordination of Maintenance staff and support for an assigned unit. One individual per unit; individuals should not be assigned other functions. 	OSC Manager	2	4
Engineering Coordination	TSC	<ul style="list-style-type: none"> Provides coordination of Engineering staff and support for an assigned unit. One individual per unit; individuals should not be assigned other functions. 	Technical Assessment Manager	2	8
Engineering Assessments	TSC	<ul style="list-style-type: none"> One team for each unit to perform engineering assessments in support of repair and corrective actions. Team composition (i.e., number and represented disciplines) as described in the Emergency Plan. Team may include personnel responsible for performing other functions for the same assigned unit. 	Operations Manager Technical Assessment Team <ul style="list-style-type: none"> Therm/Hyd Eng. Elect/I&C Eng. Mech Eng. 	2 6 6 6	3 10 8 8

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Function	Location	Key Roles & Staffing Considerations	BFN ERO Position	# Required U1/U2/U3	# Available U1/U2/U3
Unit In-Plant Team Coordination	OSC	<ul style="list-style-type: none"> Overall cognizance of on-site and in-plant teams performing or supporting repair and corrective actions for an assigned unit. One individual per unit; individuals should not be assigned other functions. 	OSC Team Coordinator	2	6
Non-Licensed Operators	OSC	<ul style="list-style-type: none"> Two individuals per unit to assist with implementation of repair and corrective actions. Should not include members of the on-shift staff. 	AUOs	12	98
Mechanical Maint Repair and Corrective Action	OSC	<ul style="list-style-type: none"> Two individuals per unit to implement repair and corrective actions. Staffing may include an on-shift individual (i.e., 2 individuals for a unit composed of 1 on-shift and 1 augmented). 	Mechanical Craftsmen	12	96
Electrical Maint Repair and Corrective Action	OSC	<ul style="list-style-type: none"> Two individuals per unit to implement repair and corrective actions. Staffing may include an on-shift individual (i.e., 2 individuals for a unit composed of 1 on-shift and 1 augmented). 	Electrical Craftsmen	12	92
I&C Repair and Corrective Action	OSC	<ul style="list-style-type: none"> Two individuals per unit to implement repair and corrective actions. Staffing may include an on-shift individual (i.e., 2 individuals for a unit composed of 1 on-shift and 1 augmented). 	I&C Technicians	12	67

Table 7-2b addresses NEI 12-01 Table 3.2, Expanded Response Functions for Phase 2 Staffing Assessment, (FSI implementation). The number required column is the personnel resources for the implementation of the two most limiting FSI tasks. The number available column is the number of personnel qualified to the position.

Table 7-2b Expanded ERO FLEX Resources

Function	Location	Key Roles & Staffing Considerations	BFN ERO Position	# Required U1/U2/U3	# Available U1/U2/U3
Evaluation of Transition Phase Coping Strategies	TSC or EOF	<ul style="list-style-type: none"> One team for each unit to evaluate selection of Transition Coping strategies; team performs evaluations not done by Control Room personnel Team composition (i.e., number and represented disciplines) as described in governing site programs, procedures and guidelines Team may include personnel responsible for performing other functions for the same assigned unit 	Operations Manager Technical Assessment Team <ul style="list-style-type: none"> Therm/Hyd Eng. Elect/I&C Eng. Mech Eng. 	2 6 6 6	3 10 8 8

BFN NEI 12-01 Phase 2 ELAP ERO Staffing Analysis Report

Function	Location	Key Roles & Staffing Considerations	BFN ERO Position	# Required U1/U2/U3	# Available U1/U2/U3
Implementation of Transition Phase Coping Strategies	OSC	<ul style="list-style-type: none"> Number and composition of personnel capable of simultaneous implementation of any two Transition Phase coping strategies at each unit (see Section 7.1.2.3) Should not include personnel assigned to other functions (e.g., emergency repair and corrective actions); however, may include members of the on-shift staff and personnel responsible for implementation of SAM strategies 	Unit Operators AUOs	6 4	48 98

Attachment 1: List of References

1. EA-12-049, NRC Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, 03/03/12
2. NEI 12-01, Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities, Revision 0
3. NEI 10-05, Assessment of On-Shift Emergency Response Organization Staffing and Capabilities, Revision 0
4. NEI document to industry peers, Generic Basis for Responses to Staffing Assessment Questions Related to Use of Security Personnel During a BDB Event Response, 12/23/13
5. 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 03/12/12
6. TVA letter to the NRC dated May 11, 2012, Sixty-Day Response to 10CFR50.54(f) Request for Information
7. Tennessee Valley Authority letter to the NRC dated June 11, 2012, Ninety-Day Response to Recommendation 9.3 of 10 CFR 50.54(f) Request for Information
8. NRC letter, Response Regarding Licensee Phase 1 Staffing Submittals Associated with Near-Term Task Force Recommendation 9.3 Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident, 10/23/13
9. TVA - Radiological Emergency Plan, Rev 104
10. NPG-SPP-18.3 Emergency Preparedness
11. EPDP-3 Emergency Plan Exercises and Preparedness Drills
12. TVAN KPI
13. Operations Group Staffing List
14. REPTRACK
15. EPIP-1, Emergency Classification Procedure, Rev 50
16. EPIP-4, Site Area Emergency, Rev 35
17. EPIP-6, General Emergency, Rev 45
18. EPIP-8, Personnel Accountability and Evacuation, Rev 26
19. EPIP-11, Security and Access Control, Rev 14
20. EPIP-14, Radiological Control Procedures, Rev 19
21. O-GOI-300-4, Switchyard Manual, Rev. 94

Attachment 1: List of References

22. 0-FSI-1, FLEX Response Instruction, Draft E
23. 0-FSI-2A, FSP1 Setup and Operation (EECW Manifold/CILRT), Rev 0 (07-14-2014)
24. 0-FSI-2E, FLEX Mechanical Hose Connections, Rev 0000A
25. 0-FSI-3A, 480V FLEX Diesel Generator Setup and Operation, Rev 0000A
26. 0-FSI-3F, Load Shed of 250V Main Bank Battery, Rev 0000A
27. 0-FSI-4A, Localized Temporary Lighting, Ventilation and Communications, Rev 0000A
28. 0-FSI-6A, Damage Assessment, Rev 0000A
29. 1/2/3-EOI-1 RPV Control, Rev 3/15/10
30. 1/2/3-EOI-5C, Rev 1/5/3
31. 1/2/3-EOP Appendix 11A, Rev 2/5/2
32. 1/2/3-EOP Appendix 16A, Rev 0/3/2
33. 1/2/3-EOP Appendix 16B, Rev 0/4/2
34. 1/2/3-EOP Appendix 16E, Rev 1/4/2
35. 1/2/3-EOP Appendix 16H, Rev 0/6/2
36. 1/2/3-EOP Appendix 16M, Rev 0000A
37. 1/2/3-EOP Appendix 20H, Rev 0000A
38. 1/2/3-EOP Appendix 20M, Rev 0000A
39. 0-AOI-57-1A, Station Blackout, Draft M
40. 1/2/3-AOI-78-1, Rev 21/28/22
41. 1/2/3-OI-35, Rev 14/65/47

Attachment 2: List of Acronyms

AC.....	Alternating Current
ANI.....	American Nuclear Insurers
AUO.....	Assistant Unit Operator
AP.....	Abnormal Procedure
BDB.....	Beyond Design Basis
BDBEE.....	Beyond Design Basis External Event
BFN.....	Browns Ferry Nuclear Plant
BOP.....	Balance of Plant
CAS.....	Central Alarm Station
CERC.....	Corporate Emergency Response Center
CR.....	Control Room
CFR.....	Code of Federal Regulations
CRS.....	Central Reporting System
CST.....	Condensate Storage Tank
DBT.....	Design Basis Threat
DC.....	Direct Current
EAL.....	Emergency Action Level
EAS.....	Emergency Alert System
EDG.....	Emergency Diesel Generator
ECL.....	Emergency Classification Level
EECW.....	Emergency Equipment Cooling Water
EDG.....	Emergency Diesel Generator
ELAP.....	Extended Loss of AC Power
EOF.....	Emergency Operations Facility
EOI.....	Emergency Operating Instruction
EPIP.....	Emergency Plan Implementing Procedure
ERDS.....	Emergency Response Data System
ENS.....	Emergency Notification System
ERO.....	Emergency Response Organization
FBL.....	Fire Brigade Leader
FBM.....	Fire Brigade Member
FESB.....	Flex Equipment Support Building
FPER.....	Fire Protection Evaluation Report
FPS.....	Flex Pump System
FSG.....	FLEX Support Guideline
FSI.....	FLEX Support Instruction
GE.....	General Emergency
HP.....	Health Physics
HPN.....	Health Physics Network

Attachment 2: List of Acronyms

I&C.....	Instrumentation and Controls
INPO.....	Institute of Nuclear Power Operations
JIC.....	Joint Information Center
LAR.....	License Amendment Request
NEI.....	Nuclear Energy Institute
NRC.....	Nuclear Regulatory Commission
NSSS.....	Nuclear Security Shift Supervisor
NTTF.....	Near Term Task Force
ODS.....	Operations Duty Specialist
O&P.....	Outage and Planning
OSC.....	Operations Support Center
PAR.....	Protective Action Recommendation
PCIV.....	Primary Containment Isolation Valve
PI.....	Public Information
RCS.....	Reactor Coolant System
RHR(SW).....	Residual Heat Removal (Service Water)
RO.....	Reactor Operator
RP/RPT.....	Radiation Protection/ Radiation Protection Technician
RRC.....	Regional Response Center
RX.....	Reactor
S&L.....	State and Local
SAE.....	Site Area Emergency
SAM/SAMG.....	Severe Accident Management/ Severe Accident Management Guideline
SAS.....	Secondary Alarm Station
SBO.....	Station Blackout
SFP.....	Spent Fuel Pool
SRO.....	Senior Reactor Operator
SRV.....	Safety Relief Valve
STA.....	Shift Technical Advisor
TRM.....	Technical Requirements Manual
TSC.....	Technical Support Center
UHS.....	Ultimate Heat Sink
UO.....	Unit Operator
V.....	Volt
WC.....	Work Control