Enclosure 1 Attachment 3 is to be withheld from public disclosure under 10 CFR 2.390. When separated from this submittal, this letter is decontrolled.

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

EA-12-049

February 28, 2013

10 CFR 2.202

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

Sequoyah Nuclear Plant, Units 1 and 2
Facility Operating License Nos. DPR-77 and DPR-79
NRC Docket Nos. 50-327 and 50-328

Subject: **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 Sequoyah Nuclear Plant**

References:

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

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

3. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August 2012 (ML12242A378)

4. Letter from TVA to NRC, "Tennessee Valley Authority - Initial Status Report in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design- Basis External Events (Order Number EA-12-049)," dated October 29, 2012 (ML12307A104)

A151
NRR

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an immediately effective order (Order Number EA-12-049) entitled "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies For Beyond-Design-Basis External Events" to "All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status" (Reference 1). The Order indicated that, as a result of the NRC's evaluation of the lessons learned from the March 2011 accident at Fukushima Dai-ichi, the NRC determined that certain actions are required by nuclear power plant licensees and construction permit holders. Specifically, the NRC required additional defense-in-depth measures to address uncertainties associated with protection from beyond-design-basis events. With respect to this Order, the NRC determined that all power reactor licensees and construction permit holders must "develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP [spent fuel pool] cooling capabilities following a beyond-design-basis external event." Specific requirements are outlined in Attachment 2 to the Order.

The Order requires submission of an overall integrated plan, including a description of how compliance with the requirements described in Attachment 2 of the Order will be achieved. The Order requires the plan to be submitted to the NRC for review by February 28, 2013. In addition, the Order requires submission of an initial status report 60 days following issuance of the final interim staff guidance and at six month intervals following submittal of the overall integrated plan, which delineates progress in implementing the requirements of the Order. The interim staff guidance containing specific details on implementation of the requirements of the order was scheduled to be issued in August 2012. Finally, the order requires full implementation of its requirements no later than two refueling cycles after submittal of the overall integrated plan, or December 31, 2016, whichever comes first, or prior to issuance of an operating license for units under construction.

The NRC issued Interim Staff Guidance on August 29, 2012 (Reference 2) which endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 3, Section 13.1 contains the specific reporting requirements for the overall integrated plan.

By letter dated October 29, 2012 (Reference 4), TVA submitted an initial status report regarding the progress in establishing mitigation strategies for beyond-design-basis external events, as required by the Reference 1 Order.

The purpose of this letter is to provide the overall integrated plan pursuant to Section IV, Condition C.1.a, of Reference 1. This letter confirms TVA has received the Reference 2 interim staff guidance and has an overall integrated plan developed in accordance with the provided guidance for the Sequoyah Nuclear Plant (SQN) to define and deploy strategies that will enhance the ability to cope with conditions resulting from beyond-design-basis external events.

The information in the enclosure to this letter provides the SQN overall integrated plan for mitigation strategies using the guidance contained in Reference 3. The enclosed Integrated Plan is based on conceptual design information. Final design details and associated procedure guidance, status of open items identified in the Enclosure, as well as any revisions to the information contained in the Enclosure, will be provided in the 6-month Integrated Plan updates required by Reference 1.

The information provided in Attachment 3 to the Enclosure is considered to contain information concerning the physical protection not otherwise designated as Safeguards Information and is designated "Security Sensitive Information" as defined in 10 CFR 2.390(d)(1). Accordingly, TVA requests that the information provided in Attachment 3 to the Enclosure to this letter be withheld from public disclosure.

The Enclosure describes the plans that TVA will use to meet the regulatory requirements outlined in Attachment 2 of Reference 1, but does not identify any additional actions to be taken by TVA. Therefore, this letter contains no regulatory commitments.

If you have any questions regarding this report, please contact Kevin Casey at (423) 751-8523.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on the 28th day of February 2013.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosure:

Sequoyah Nuclear Plant, Mitigation Strategies for Beyond-Design-Basis External Events Overall Integrated Plan

cc (Enclosure):

NRR Director - NRC Headquarters
NRO Director - NRC Headquarters
NRC Regional Administrator - Region II
NRR Project Manager - Sequoyah Nuclear Plant
NRC Senior Resident Inspector - Sequoyah Nuclear Plant

ENCLOSURE

SEQUOYAH NUCLEAR PLANT

MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS OVERALL INTEGRATED PLAN

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT
UNITS 1 AND 2

FLEX
OVERALL INTEGRATED PLAN

General Integrated Plan Elements

Sequoyah 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 Sequoyah 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 Sequoyah site has been reviewed against 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. Sequoyah has determined the functional threats from each of these hazards and identified FLEX equipment that may be affected. The FLEX storage locations will provide the protection required from these hazards. Sequoyah is also developing procedures and processes to further 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 will be assessed based on the current Sequoyah seismic licensing basis to ensure that the equipment remains accessible and available 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. From Reference 4, Section 2.5.2.4, safe shutdown earthquake (SSE) requirements of 0.18 g horizontal and 0.12 g vertical maximum ground accelerations. For an operating basis earthquake (OBE), the maximum horizontal and vertical ground accelerations are 0.09g and 0.06 g, respectively (Reference 4, Section 2.5.2.4). The FLEX strategies developed for Sequoyah will include documentation ensuring that any storage locations and deployment routes meet the FLEX seismic criteria.

Liquefaction

The liquefaction potential of all FLEX deployment routes will be addressed in a future assessment (Open Item OI 2).

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 (Reference 4, Section 2.4.2.2). Only the Reactor Building, Diesel Generator Building (DGB), and Essential Raw Cooling Water Intake Station will remain dry during the flood (Reference 4, Section 2.4A.2.1). Plant cooling requirements, with the exception of the fire protection system which must supply water to the steam generators, will be met by the ERCW system (Reference 4, Section 2.4A.2.1). 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 (Reference 4, Section 2.4A.2.1).

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 (Reference 4, Section 2.4.2.2). Snow melt and ice jam considerations are also unnecessary because of the temperate zone location of the plant (Reference 4, Section 2.4.2.2). 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 (Reference 4, 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 (Reference 4, Section 2.4.5).

Per Reference 4, Section 2.4.2.2, the maximum plant site flood level from any cause is Elevation 719.6 ft. This information has been superceded by Reference 5. The maximum plant site flood level from any cause is Elevation 722.0 ft (still reservoir). This elevation would result from the probable maximum storm. Coincident wind wave activity results in wind waves of up to 4.2 ft (crest to trough). Run up on the 4:1 slopes approaching the Diesel Generator Building reaches Elevation 723.2 ft. Wind wave run up on critical vertical external, unprotected walls including the Emergency Raw Cooling Water (ERCW) Intake Pumping Station, Auxiliary, Control and Shield Buildings is 726.2 ft. (Reference 5).

In summary, all equipment required to maintain the plant safely during all flooding events including the design basis flood is either designed to operate submerged, is located above the maximum flood level, or is otherwise protected. Accordingly, FLEX strategies will be developed for consideration of external flooding hazards. In addition, Sequoyah is also developing procedures and strategies for delivery of offsite FLEX equipment during Phase 3 which considers regional impacts from flooding.

High Wind:

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

Sequoyah 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 Sequoyah 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 Sequoyah. Therefore, high-wind hazards are applicable to the

Sequoyah site.

In summary, based on available local data and Figures 7-1 and 7-2 of Reference 2, Sequoyah 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 Sequoyah site is located approximately 7.5 miles northeast of Chattanooga in Hamilton County, Tennessee, on a peninsula on the western shore of Chickamauga Lake at Tennessee River mile 484.4 (Reference 4, Section 1.1). The site is approximately 14 miles west-northwest of Cleveland, Tennessee and approximately 31 miles south-southwest of Watts Bar Nuclear Plant (Reference 4, Section 2.1.1). The approximate site location is given below (Reference 4, Table 2.1.1-1):

LATITUDE (degrees/minutes): 35°14' N
LONGITUDE (degrees/minutes): 85°5' W

From Reference 4, Table 2.3.2-16, the mean temperatures in Chattanooga, Tennessee have been in the low 40s°F in the winter. The extreme minima temperature recorded was -10°F in the winter (Reference 4, Table 2.3.2-16).

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

Applicability of ice storms:

The Sequoyah 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 hinderances caused by ice storms.

In summary, based on the available local data and Figures 8-1 and 8-2 of Reference 2, the Sequoyah 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 Reference 4, Table 2.3.2-16, mean temperatures in Chattanooga, Tennessee can reach the upper 80s°F in the summer. Extreme maxima temperature recorded was 106°F in the summer (Reference 4, Table 2.3.2-16).

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

Key Site assumptions to implement NEI 12-06 strategies. **Ref: NEI 12-06 Section 3.2.1**	*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.

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 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 all alternating current (ac) power (ELAP) / loss of 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 (rate is dependent on the RCP seal design)

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 is sufficient.

Assumptions Specific to Sequoyah Site

A1. The FLEX strategies for Sequoyah are based on comparison to Watts Bar specific analysis results documented in Reference 11. Similar requirements and designs will be implemented for the Sequoyah site, as the Watts Bar and Sequoyah sites share similar designs. Sequoyah site specific analyses will be completed and these results will be included in the August 2013 six month submittal update.

A2. The condensate storage tanks (CSTs) and associated piping are not seismically qualified or hardened against missiles and tornados. Sequoyah will either modify the CSTs such that it will be qualified to be robust with respect to high winds and seismic events or construct an alternate seismic and missile protected CST. Throughout this document, several strategies refer to the use of the CSTs as a suction source. However, these strategies will also apply to the use of a new alternate seismic and missile protected CST, as it is intended for this tank to be constructed within close proximity of the current CSTs. Therefore, this document will only refer to the current CSTs in the strategy descriptions. In addition, it is assumed that piping analysis will be performed to ensure that either of these tanks will not leak out through the piping and can be credited.

A3. Sequoyah 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.

A4. The design hardened connections added for the purpose of FLEX are protected against external events or are established at multiple and diverse locations.

A5. 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.

A6. To support time sensitive FLEX actions, it is assumed adequate staffing levels will be available. Required staffing levels will be 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.

Staffing levels will be assessed to confirm this assumption, or adjustments will be made to plant staffing or FLEX design to meet this requirement.

A7. Sequoyah will design 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). If equipment will be stored in another location for a particular function, it is noted in the section for that function.

A8. Considerations for exceptions to the site security plan or other license/site specific requirements will be included in the FLEX support guidelines.

A9. In the event of a flood scenario, pumps will be staged on the Auxiliary Building roof, which will require cranes or alternate equipment to be available to move equipment.

A10. Instrumentation on FLEX equipment will be used to confirm continual performance.

A11. It is assumed that either two or four low leakage RCP seals will be installed and credited at both units for Sequoyah. Sequoyah site-specific RCS makeup analysis will size the high pressure FLEX pump accordingly (Open Item OI 18).

A12. 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 are being 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 will be incorporated into the unit 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**	*Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action.*
Sequoyah Nuclear plans to fully comply with the guidance in JLD-ISG-2012-01 (Reference 3) and NEI 12-06 (Reference 2) in implementing FLEX strategies for the Sequoyah site.	
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**	*Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walkthrough of deployment).* *Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 1A* *See attached sequence of events timeline (Attachment 1A).* *Technical Basis Support information, see attached NSSS Significant Reference Analysis Reconciliation Table (Attachment*

	1B)

The sequence of events and any associated time constraints are identified below for Sequoyah Reactor Core Cooling and Heat Removal (steam generators available) strategies for FLEX Phases 1 through Phase 3, based on the Watts Bar results documented in Reference 11. See attached sequence of events timeline (Attachment 1A) and the technical basis support information in Attachment 1B for a summary of this information.

Discussion of action items identified in Attachment 1A table:

1. Initial Load Shed – completed within 45 minutes (0.75 hours) following the start of the event.
2. Declare ELAP – ELAP entry conditions can be verified by control room staff and it is validated that emergency DGs 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.
3. Extended Load Shed – completed within 90 minutes (1.5 hours) following the start of the event. This consists of additional load shedding such that generally, only FLEX required loads remain powered.
4. Debris Removal (Access) - The earliest need for debris removal access paths is 6 hours after the start of the event, to support alignment of the low pressure FLEX pump to the essential raw cooling water (ERCW) headers and RCS makeup pump staging. This process will be initiated in order to complete the action prior to deployment depending on the resources available.
5. Sequoyah will develop 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. The RCS make-up pump will be aligned from the boric acid tank (BAT) within 8 hours for boration. Plant cooldown commences at 8 hours and RCS make-up is required for shrinkage. This time also allows for adequate boration (Reference 11).
7. Hoses will need to be deployed to the SFP area within 6.9 hours. This is the need time based on the SFP time when boil off occurs (Reference 11). This is for an SSE seismic event and an initial bulk water temperature in the pool of 100°F (Open Item OI 8).
8. Venting of the SFP area will need to be completed within 6.9 hours based on the SFP time when boil off occurs (Reference 11). This is for an SSE seismic event and an initial bulk water temperature in the pool of 100°F. (Open Item OI 8).
9. Align 225 kVA 480 Vac Generator – the earliest need time for the generator is 8 hours, when it will be needed to power the battery chargers to power the DC and AC Vital Power System (Reference 11).
10. Delayed plant cooldown will commence at 8 hours following the start of the event. It must be completed before 12 hours (Reference 11).
11. Alternate fuel supply will need to be established within 11 hours. This accounts for the 8 hours in which the FLEX equipment fuel supply depletes and the deployment time. This is an assumption and will need to be assessed for a more exact basis once all FLEX equipment has been purchased and equipment specifications are known (Open Item OI 3) (Reference 11).
12. The CST will be depleted in 10 hours, at which time the turbine driven auxiliary feedwater pump (TDAFWP) suction will be realigned to the ERCW headers to extend core cooling by use of

standing water in the headers (Reference 11).

13. Acceptable control room lighting will be planned to be established for long term support. This is not a time constraint as control room lighting is available via batteries, and portable lighting will be available for necessary activities (Reference 11).
14. The CST will be depleted in 10 hours and the standing water in the ERCW headers will deplete in 18.5 hours (Reference 10). It is noted the timing and deployment analysis is based on the Watts Bar specific analysis. A Sequoyah site-specific analysis will be performed to support the Sequoyah site specific values (Open Item OI 20). The low pressure FLEX pump will need to be aligned to the ERCW headers to provide suction to the intermediate pressure FLEX pump for steam generator (SG) makeup prior to both of these sources depleting.
15. The make-up pump to the steam generators will need to be aligned within 24 hours. While the TDAFWP is not anticipated to fail, a backup pump will be staged as soon as feasible (Reference 11).
16. The Vital Battery and Switchgear 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 (Open Item OI 11) (Reference 14).
17. The Main control room HVAC study determined that ventilation not required until 24 hours into the ELAP event; at which point it can be monitored periodically if needed (Open Item OI 11) (Reference 14).
18. 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 (Open Item OI 11) (Reference 14).
19. A time of 72 hours is assumed to align the mobile water purification system to provide clean water to refill the CST. However, ERCW supply is available to be provided indefinitely (Reference 11).
20. The SFP makeup via the ERCW headers will need to be aligned within 37 hours. This is based on the time when boil off decreases the water level to 10 feet above the SFP racks, determined in analyses contained in Reference 11 (Open Item OI 8).
21. The mobile boration unit from the regional response center (RRC) will need to be aligned within 72 hours. This is based on analysis timeline values (from Reference 11).
22. Large generators will need to be aligned within 72 hours, this is based on the eventual loss of capability to support SG feed strategy (Reference 11).
23. Large fuel truck service will need to be established within 72 hours. This is based on the depletion of on-site supplies and supplying larger equipment (Reference 11).
24. Replenishment of the Forebay volume will need to be established at a time greater than 72 hours to be determined (Open Item OI 23).

To confirm the times given above, Sequoyah will prepare procedures for each task, perform time study walkthroughs for each of the tasks under simulated ELAP conditions, and account for equipment tagging and other administrative procedures required to perform the task. In addition, an evaluation on 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 (Open Item OI 13).

Identify how strategies will be deployed in all modes. **Ref: NEI 12-06 section 13.1.6**	*Describe how the strategies will be deployed in all modes.*

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. Figure A3-29 shows a visual representation of the deployment strategy.

Provide a milestone schedule. This schedule should include: • **Modifications timeline** o **Phase 1 Modifications** o **Phase 2 Modifications** o **Phase 3 Modifications** • **Procedure guidance development complete** o **Strategies** o **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**	

The dates specifically required by the order are obligated or committed dates. Other dates are planned dates subject to change. Updates will be provided in the periodic (six month) status reports.

See attached milestone schedule Attachment 2.

Identify how the programmatic controls will be met. Ref: NEI 12-06 Section 11 JLD-ISG-2012-01 Section 6.0	

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

The unavailability of equipment and applicable connections that directly performs a FLEX mitigation strategy will be managed using plant equipment control guidelines developed in accordance with NEI 12-06 Rev. 0 Section 11.5.

Programs and controls will be established to assure personnel proficiency in the mitigation of beyond-design-basis events is developed and maintained in accordance with NEI 12-06 Rev. 0 Section 11.6.

The FLEX strategies and basis will be maintained in an overall program document. Existing plant configuration control procedures will be modified to ensure that changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies in accordance with NEI 12-06 Rev. 0 Section 11.8.

Procedure Guidance

Sequoyah is a participant in the PWROG project PA-PSC-0965 and will implement the FLEX Support Guidelines (FSGs) in a timeline to support the implementation of FLEX by December 2015. The PWROG has generated these guidelines to assist utilities with the development of site-specific procedures to cope with an ELAP in a manner compliant with the requirements of Reference NEI 12-06.

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 FSGs 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 FSGs are implemented based upon actual plant conditions.

Sequoyah will continue participation in PA-PSC-0965 and will update plant procedures upon the completion of the PWROG program. It is anticipated that the following FSGs will be incorporated into existing plant procedures in order to develop the FSG interface:

- Alternate auxiliary feedwater (AFW) Suction Source
- Alternate Low Pressure Feedwater
- ELAP direct current (dc) Load Shed/Management
- Initial Assessment and FLEX Equipment Staging
- Alternate CST Makeup
- Loss of dc Power

- Alternate RCS Boration
- Long Term RCS Inventory and Temperature Control
- Passive RCS Injection Isolation
- Alternate SFP Makeup and Cooling
- Alternate Containment Cooling
- Transition from FLEX Equipment

Maintenance and Testing

The FLEX mitigation equipment will be initially tested (or other reasonable means used) to verify performance conforms to the limiting FLEX requirements. It is expected the testing will include the equipment and the assembled sub-systems to meet the planned FLEX performance. Additionally, Sequoyah will implement the maintenance and testing template upon issuance by the Electric Power Research Institute (EPRI). The template will be developed to meet the FLEX guidelines established in Section 11.5 of Reference 2.

Staffing

The FLEX strategies documented in the event sequence analysis (as summarized in Reference 10) 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

Sequoyah will have to address staffing considerations in accordance with Reference 2 to fully implement FLEX at the site.

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, Sequoyah will maintain the FLEX strategies and basis in an overall program document and will modify existing plant configuration control procedures to ensure changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies.

Describe training plan	Training plans will be developed for plant groups such as the emergency response organization (ERO), Fire, Security, Emergency Preparedness (EP), Operations, Engineering, and Maintenance. The training plan development will be done in accordance with Sequoyah procedures using the Systematic Approach to Training, and will be implemented to ensure that the required Sequoyah staff is trained prior to implementation of FLEX.

Describe Regional Response Center plan	The nuclear industry will establish two RRCs to support utilities during beyond design basis events. Each RRC will hold five sets of equipment, four of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. Equipment will be moved from an RRC to a local Assemble Area, established by the Strategic Alliance for FLEX Emergency Response (SAFER) team and TVA. Communications will be established between Sequoyah and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of Sequoyah's playbook, will be delivered to the site within 24 hours from the initial request. TVA will establish a contract with the SAFER team in accordance with the requirements of Section 12 of Reference 2 (OI 28). Sequoyah will determine where Phase 3 equipment will be staged (Open Item OI 5).

Notes:

1. Maintenance and testing, configuration control, training, and regional response center plans are currently being 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/EFW**
- **Depressurize SG for Makeup with Portable Injection Source**
- **Sustained Source of Water**

Reference 3: JLD-ISG-2012-01 Sections 2 and 3

PWR Installed Equipment Phase 1

Core Cooling with SGs Available

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. An SBO occurs to start the scenario and all ac power is assumed to be lost. The TDAFWP will start as designed at the start of the ELAP event and will continue to provide cooling through the SGs once RCS cooldown is initiated. Initial alignment of the TDAFWP suction is to the CST. Analysis shows that each of the current CSTs has a minimum volume of 240,000 gallons as summarized in Reference 10. One of these tanks would provide approximately 10 hours of inventory to the suction of the TDAFWP at a single unit before the CST is depleted.

When the CST is depleted, suction flow to the TDAFWP can be provided by standing water in the ERCW header for an additional 18.5 hours as summarized in Reference 10. It is noted the timing and deployment analysis is based on Watts Bar. A Sequoyah site-specific analysis is to be performed to support the Sequoyah site-specific values (Open Item OI 20).

Core Cooling with SGs Not Available

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, Sequoyah will take actions to proceduralize administrative controls to pre-stage FLEX equipment prior to entering a

[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.

condition where the SGs cannot provide adequate core cooling. (Open Item OI 12).	
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 (Reference 17) currently addresses implementation of this strategy. The strategies in ECA-0.0 will be supported by the appropriate FSG for this strategy, when the FSG is developed.
Identify Modifications	*List modifications and describe how they support coping time.* 1.Modifications that are required for the CSTs are discussed in the Key Site Assumptions (Open Item OI 1).
Key Reactor Parameters	1. SG Wide Range Level or Narrow Range Level with AFW Flow indication 2. SG Pressure 3. CST 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 For all instruments listed above the normal power source and the long-term power source is the 125 Vdc Vital Battery. *This instrumentation is only available until flood water enters the auxiliary instrument room. The potential validating indicator for T_{cold} is SG pressure when natural circulation is occurring. This substitution is allowed by guidance provided in Reference 16. **This instrumentation is only available until flood water enters the auxiliary instrument room (OI 26). The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in

	Reference 16. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.

Notes:

1. Core cooling strategies are provided for conditions where SGs are available or where SGs are not available but a sufficient RCS vent has been 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 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

Transistion to Phase 2 is required before the CST inventory and standing water in the ERCW headers is depleted at 28.5 hours as summarized in Reference 10. It is noted the timeline and deployment analysis is based on Watts Bar. A Sequoyah site-specific analysis is to be performed to support the Sequoyah site-specific values (Open Item OI 20).

To provide an unlimited supply of water for core cooling during Phase 2, a low pressure FLEX pump will be used to pressurize the ERCW headers which can then be used for direct supply to the TDAFWP suction. Surviving, non-seismic, clean water tanks can also be used to refill the CST using transfer pumps.

An intermediate pressure FLEX pump will be provided for supplying water to the SGs for core cooling after operating conditions of the TDAFWP cannot be maintained. The intermediate pressure FLEX pump will supply water to the auxiliary feedwater piping downstream of the TDAFWP or motor driven auxiliary feedwater pumps (MDAFWP)s. The intermediate pressure FLEX pump staging location for non flood conditions is near the CST which is the suction source for this condition. The intermediate pressure FLEX pump is moved to the Auxiliary Building roof during preparation for flood conditions and the suction source is from the ERCW headers or flood waters. The storage locations, deployment paths and staging locations for the FLEX equipment are provided in Attachment 3.

For the non-flood conditions, Sequoyah will gradually transition to a long term core cooling strategy. This will include the use of the low pressure FLEX pump on-site to provide flow to the component cooling system CCS heat exchanger and the on-site 3 megawatt (MW) diesel generator (DG) to repower both the CCS and residual heat removal (RHR) pumps. As the 3 MW DGs are not required to support the coping strategies, but rather long-term cooling strategies, additional details are not included in this submittal.

For the flood conditions, the RHR pumps may be under water, depending on the severity of the flood. In this scenario, the plant would continue supplying water to the SGs using the intermediate pressure FLEX pump supplied by water from the ERCW headers or flood waters.

Core Cooling with SGs Not Available

For an event that occurs with a unit in core cooling with SGs not available, the transition to Phase 2 strategies will be required as inventory is lost from the RCS. Reactor core cooling and heat removal with SGs not available will be provided by using the intermediate pressure FLEX pump to inject water into the intermediate safety injection system.

Core cooling is maintained through heat removal from the RCS via coolant boil off. Prior to loss of gravity feed from the RWST, the intermediate pressure FLEX pump must be aligned to take suction from the RWST or another acceptable alternate coolant source and deliver the coolant to the vessel.

The connections utilized for RCS Inventory Control/Long-Term Subcriticality will also be utilized for reactor core cooling and heat removal with SGs not available (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 70 hours in order to preclude the RCS fluid from the incipient boric acid precipitation point.

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 2	
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 EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance and Sequoyah's strategy aligns with the generic guidance and will consider the nuclear steam supply system (NSSS) specific guidance once available.
Identify modifications	*List modifications necessary for Phase 2* 1. The backup instrument air supply lines to the SG Atmospheric Relief Valves (ARVs) and Auxiliary Feedwater (AFW) Level Control Valves (LCVs) will be moved to above the probable maximum flood (PMF) elevation for flood condition response. 2. Connections will be made on the ERCW headers in the Auxiliary Building for supplying water to the CST or the intermediate pressure FLEX pump. 3. The primary connection point for SG cooling will be upstream of the SG LCVs on the TDAFWP discharge line. 4. The secondary connection point for SG cooling will be upstream of the SG LCVs in both the train A and train B MDAFWP discharge piping. A connection to both trains is needed for the secondary connection to ensure feed to all four SGs. 5. A new connection to take suction from the CST is required. 6. New connections will be made at the ERCW headers in the CCW Building for the low pressure FLEX pump to pressurize the ERCW headers during non-flood conditions. 7. New connections will be made at the ERCW headers in the 5th Diesel Generator Building for the low pressure FLEX pump to pressurize the ERCW headers during flood condtions. 8. New connections will be made to the Primary Water Storage Tank (PWST) and Demineralized Water Storage Tank (DWST) for transferring water to refill the CST.
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

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 2	
	2. SG Pressure 3. CST 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 instrumentation listed above the normal power source and the long-term power source are the 125 Vdc Vital Battery. *This instrumentation is only available until flood water enters the auxiliary instrument room. The potential validating indicator for T_{cold} is SG pressure when natural circulation is occurring. This substitution is allowed by guidance provided in Reference 16. **This instrumentation is only available until flood water enters the auxiliary instrument room (OI 26). The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	Portable equipment required to implement this FLEX strategy will be maintained in the FESB, which will be designed for seismic loading in excess of the minimum requirements of American Society of Civil Engineers (ASCE) 7-10.

Maintain Core Cooling & Heat Removal	
PWR Portable Equipment Phase 2	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	Portable equipment required to implement this FLEX strategy will be maintained in the FESB which is sited in a suitable location that is above the PMF level and as such is not susceptible to flooding from any source.
Severe Storms with High Winds	Portable equipment required to implement this FLEX strategy will be maintained in the FESB, which is designed to meet or exceed the licensing basis high wind hazard for Sequoyah.
Snow, Ice, and Extreme Cold	The FESB will be evaluated for snow, ice and extreme cold temperature effects and heating will be provided as required to assure no adverse effects on the FLEX equipment. The FESB will have a standalone HVAC system.
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.

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 intermediate pressure FLEX pump will be located in the steam valve room upstream of the LCVs on the TDAFWP discharge piping. For this alignment during non-flood conditions, suction to the intermediate pressure pump will be taken from the CST or ERCW	<u>Primary connection modifications:</u> • A tee will be added to the TDAFWP discharge line. • An isolation valve will be added to the main line upstream of connection. • An isolation valve will be added to the new branch. • Storz cap/adapter will be added to new branch.	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The primary connection is located inside the Auxiliary Building. The auxiliary building is a safety related structure and is protected from all external hazards except

headers. During flood conditions suction will be taken from the ERCW headers or a submersible pump suppying flood water. Discharge of the intermediate pressure pump 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 A3-24 and A3-25.	CST modifications: A Storz hose connection will be added to the existing valve at the bottom of each CST. ERCW modifications: For non-flood conditions, the low pressure FLEX pump will be staged near the CCW building. The existing ERCW piping in the CCW building must be modified to add isolation valves with hose connections to allow the ERCW headers to be pressurized. For flood conditions, the low pressure FLEX pump will be staged next to the 5th Diesel Generator Building. The existing ERCW piping inside the 5th Diesel Generator Building will be modified to add isolation valves with hose connections to allow the ERCW headers to be pressurized. To supply water for refill of the CST or direct suction to the intermediate pressure FLEX pump, existing ERCW headers cleanout ports in the Auxiliary Building will be utilized. The cleanout ports must be modified to add a Storz hose connection. Other tank modifications: An isolation valve and Storz hose connections will be added to the PWST and DWST for use of water transfer pumps to provide water to	flooding. For flood conditions, procedures will ensure that hoses are connected before flood levels reach the connection. The connections to the CST and ERCW will be seismically qualified and missile protected. For connections required during flood conditions, procedures will ensure that hoses are connected before flood levels reach the connection. There are no sources of debris immediately near the location of the connection point. Debris removal will be required if debris exists in this location. 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.

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 2		
	refill the CST or direct supply.	
SGs Available The secondary connection will be located in the Auxiliary Building upstream of the LCVs on the MDAFWP discharge piping. For this alignment, suction will be taken from the CST or ERCW and discharged through the intermediate pressure FLEX pumps to the connection points shown in Attachment 3, Figure A3-2. The secondary connection point is for flood conditions. The proposed hose routing for the secondary connection and the associated equipment staging area can be found in Attachment 3, Figures A3-3 and Figures A3-5 through A3-8. ERCW connections can be found in Attachment 3, Figures A3-26 and A3-27.	Secondary connection modifications: • Hard piping will be installed between the high pressure fire protection (HPFP) Train A and Train B flood conditions supply piping and the MDAFWP Train A and Train B piping which will replace the existing removable spool piece. • A tee will be added to this piping • Add isolation valve to either side of new tee. • Add isolation valve on new branch. • Storz cap/adapter will be added to new branch. CST, ERCW, and other tank modifications: Same as primary.	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The secondary connection is located inside the Auxiliary Building. The Auxiliary Building is a safety related structure and is protected from all external hazards except flooding. For flood conditions, procedures will ensure that hoses are connected before flood levels reach the connection. The connections to the CST and ERCW will be seismically qualified and missile protected. For connections required during flood conditions, procedures will 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.
SGs Not Available When SGs are not available, suction will be taken from the RWST and discharged through the intermediate pressure FLEX pumps staged near the RWST	Primary Connection Modification • Install tee or weldolet, • Add two isolation valves • Add a hose adapter BAT Modification	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The primary connection and BAT

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 2		
connection to the primary connection point.	• Install tees on discharge lines of BAT A. • Add an isolation valve on the branch. • Add a Storz adapter with cap on branch. <u>RWST modifications:</u> A connection attached to manhole at the bottom of each RWST with one isolation valve.	connection are located inside the Auxiliary Building. The Auxiliary Building is a safety related structure and is protected from all external hazards except flooding. For flood conditions, procedures will ensure that hoses are connected before flood levels reach the connection. The RWST connection will be seismically qualified and missile protected. For connections required during flood conditions, procedures will 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 and discharged through the intermediate pressure FLEX pumps staged near the RWST connection to the secondary connection point.	The secondary connection modification for steam generators not available is identical to the primary, except for on safety injection pump (SIP) Train B discharge. <u>BAT and RWST Modification</u> Same as primary.	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The secondary connection and BAT connection are located inside the Auxiliary Building. The Auxiliary Building is a safety related structure and is protected from all external hazards except flooding. For flood conditions, procedures will ensure that hoses are connected before flood levels reach the connection. The RWST connection will be seismically qualified and missile protected. For connections required during flood conditions, procedures will ensure that hoses are connected before flood levels

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 2		
		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 A3-8 in Attachment 3 provide the deployment routes from the staging locations for each Intermediate pressure FLEX pump to the pump suction source and to the primary and secondary connection points on the AFW system.
3. Core cooling strategies are provided for conditions where SGs are available or where SGs are not available but a sufficient RCS vent has been 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, Sequoyah will continue the Phase 2 coping strategies with additional assistance provided from offsite equipment/resources. Backup or alternate Phase 2 FLEX equipment will be provided by the RRC as necessary. Additionally, purification of water at each unit will be supported by a mobile water purification unit from the RRC. This unit will process water from the Tennessee River or other raw water sources to remove particulate and demineralize the water. The purification equipment will have an internal pump and be locally powered by diesel fuel. This water would then be used to refill the CST. <u>Core Cooling with SGs Not Available</u> Reactor core cooling with SGs not available is adequately maintained via the Phase 2 strategy; however, borated sources are limited. 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. Sequoyah will determine where Phase 3 equipment will be staged (Open item OI 5).	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available. Finally, Sequoyah will include in procedures notification of the RRC to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities.
Identify modifications	Each of the Phase 3 strategies will utilize common connections 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. CST 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 are the 125 Vdc Vital Battery. *This instrumentation is only 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 only available until flood water enters the auxiliary instrument room (OI 26). The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.

Maintain Core Cooling & Heat Removal		
PWR Portable Equipment Phase 3		
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 be the first priority and would 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 CST. This unit would have an internal pump and be locally powered.	Each of the Phase 3 strategies will utilize common connections as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The system will take suction directly from the Tennessee River or other raw water source. The discharge connections will be identical to the ones used for 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 has been 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

Determine Baseline coping capability with installed coping[2] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06:

- **Low Leak RCP Seals or RCS makeup required**
- **All Plants Provide Means to Provide Borated RCS Makeup**

PWR Installed Equipment Phase 1:

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain RCS inventory control. Identify methods (Low Leak RCP Seals and/or 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 steam generators are available. RCS inventory control and subcriticality issues for conditions where steam generators 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 performed at 8 hours after the ELAP. At the time the plant cooldown is initiated, a means to borate the RCS is required. Natural circulation is maintained by ensuring adequate RCS inventory.

Sequoyah is installing low leak rate seals which will reduce the potential seal leakage to approximately 1 gpm per RCP. This installation will significantly extend the time when RCS makeup may be required. Both Unit 1 and Unit 2 will have at least 2 SHIELD®[3] seals installed before the full implementation of FLEX.

Utilizing WCAP-17601 methodology (Reference 7), Reference 10 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). This is based on the information in Reference 11 which assumes 4 SHIELD® seals installed. A Sequoyah site-specific RCS makeup analysis will evaluate the impact of only having 2 SHIELD® seals installed. (Open Item OI 18).

RCS inventory is not a significant concern for the ELAP scenario due to the installation of the low leakage RCP seals. A FLEX pump would be required approximately 27 hours after the ELAP to ensure that single phase natural circulation is maintained. . However, boration is required prior to 27 hours, so inventory will be provided to the RCS prior to the required time.

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[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.

[3] *SHIELD® is a registered trademark of Westinghouse Electric Company LLC in the United States and may be registered in other countries throughout the world. All rights reserved. Unauthorized use is strictly prohibited.*

Maintain RCS Inventory Control	
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 all procedural guidance required for maintaining RCS inventory during Phase 1. Procedures and guidance to support implementation of a boration strategy, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available.
Identify Modifications	*List modifications* 1. Installation of at least 2 low leakage RCP seals (SHIELD®) per unit.
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. 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 are the 125 Vdc Vital Battery. *This instrumentation is only 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 only available until flood water enters the auxiliary instrument room (OI 26). The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3

Maintain RCS Inventory Control	
	of NEI 12-06.
Notes: None	

Maintain RCS Inventory Control

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 RCS Inventory Control. Identify methods(Low Leak RCP Seals and/or 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.

For boration, a high pressure FLEX pump would be required to be deployed and capable of injecting borated fluid into the RCS just prior to the initiation of the plant cooldown to ensure that subcriticality is maintained in the core when suction is taken from the BAT. Additionally, a means to ensure that the accumulators will not inject into the RCS, rather than the BAT, will need to be initiated prior to plant cooldown. This can be achieved by either isolating the accumulators prior to plant cooldown, or sizing the high pressure FLEX pump so that the RCS will remain at a pressure at which the accumulators would not inject.

If the external event occurs when SGs are available, the RCS will require makeup beginning at 8 hours to maintain adequate boration and makeup for any minor leakage in the system. This function is provided by using a high pressure FLEX pump to supply coolant from the BATs or RWST into existing SIP discharge piping. SIP piping is utilized to supply coolant to the RCS because the system remains at high pressure throughout Phase 2. The electric pump is powered by the 225 kVA 480 Vac DG, which will be aligned prior to when RCS makeup will begin.

Analysis shows that the BATs are available for at least 24 hours for floods as summarized in Reference 10. This is sufficient time to borate the RCS and recover pressurizer level such that RVLIS is not needed when the Auxiliary Building floods. At 24 hours, suction of the RCS pump may need to be switched to the RWST, if the impending flood level is high enough to flood the BATs.

Sequoyah will gradually transition to a long term core cooling strategy. For non-flood conditions, this strategy involves cooling the core with one train of installed RHR equipment, one train of CCS equipment, and using the low pressure FLEX pump to supply water to the CCS heat exchanger. Once this strategy is initiated, the RCS can be fully depressurized and inventory control will no longer be required.

For flood conditions, the strategy is to transition to long term core cooling by continuing to cope using Phase 2 strategies.

Details:

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available.
Identify modifications	*List modifications* 1. The primary connection will be to the SIP Train A discharge piping. 2. The secondary connection will be to the SIP Train B piping. 3. An additional option for a connection point is to the flood mode boration makeup system (FMBMS). 4. A connection will be added to the BAT A discharge line. 5. A connection will be added to each RWST 6. Installation of at least 2 low leakage RCP seals (SHIELD®) per unit.
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. 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 are the 125 Vdc Vital Battery. *This instrumentation is only 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 only available until flood water enters the auxiliary instrument room (OI 26). The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 2:	
	of NEI 12-06.
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	In addition to equipment being stored in the FESB (as described in the Reactor Core Cooling and Heat Removal section) for this function, equipment will be stored in the Auxiliary Building, which is seismically qualified.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	In addition to equipment being stored in the FESB (as described in the Reactor Core Cooling and Heat Removal section) for this function, equipment will be stored in the Auxiliary Building. 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	In addition to equipment being stored in the FESB (as described in the Reactor Core Cooling and Heat Removal section) for this function, equipment will be stored in the Auxiliary Building, which is protected from high winds.
Snow, Ice, and Extreme Cold	In addition to equipment being stored in the FESB (as described in the Reactor Core Cooling and Heat Removal section) for this function, equipment will be stored in the Auxiliary Building, which is an environmentally controlled building and provides protection from snow, ice, and extreme cold effects.
High Temperatures	In addition to equipment being stored in the FESB (as described in the Reactor Core Cooling and Heat Removal section) for this function, equipment will be stored in the Auxiliary Building, which is an environmentally controlled building and provides protection from high temperature effects.

Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed	*Identify modifications*	*Identify how the connection is protected*

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 2:		
to the point of use.		
The primary RCS connection will be on the SIP Train A discharge line, in the SIP room. This connection is used only during non-flood conditions. For this alignment, suction will be taken from the BATs or RWST and discharged through the high pressure FLEX pumps to the existing connection points shown in Attachment 3, Figure A3-9. The proposed hose routing for the primary connection and the associated equipment can be found in Attachment 3, Figures A3-12 through A3-14. During Mode 5 and 6 with SGs unavailable, suction will be taken from the RWST and discharged through the intermediate pressure FLEX pumps (staged near the RWST connection) to the primary connection point.	<u>Primary Connection Modification</u> • Install tee or weldolet • Add two isolation valves • Add a hose adapter <u>BAT Modification</u> • Install tees on discharge lines of BAT A. • Add an isolation valve on the branch. • Add a Storz adapter with cap on branch. <u>RWST modifications:</u> A connection attached to manhole at the bottom of each RWST with one isolation valve.	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The primary connection and BAT connection are located inside the Auxiliary Building. The Auxiliary Building is a safety related structure and is protected from all external hazards except flooding. The RWST connection will be seismically qualified and missile protected. For connections required during flood conditions, procedures will ensure that hoses are connected before flood levels reach the connection.
The secondary RCS connection will be on the SIP Train B discharge line, in the SIP room. This connection is used only during non-flood conditions. For this alignment, suction will be taken from the BATs or RWST and discharged through the high pressure FLEX pumps to the connection points shown in Attachment 3, Figure A3-9. The proposed hose routing for the secondary RCS FLEX connection and the associated	The secondary connection modification is identical to the primary, except for on the SIP Train B discharge. <u>BAT and RWST Modifications:</u> Same as primary.	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The secondary connection and BAT connection are located inside the Auxiliary Building. The Auxiliary Building is a safety related structure and is protected from all external hazards except flooding. The RWST connection will be

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 2:		
equipment can be found in Attachment 3, Figure A3-12 and Figures A3-18 through 20. During Modes 5 and 6 with SGs unavailable, suction will be taken from the RWST and discharged through the intermediate pressure FLEX pumps staged near the RWST connection to the secondary connection point.		seismically qualified and missile protected.
An additional RCS connection (for flood conditions only) will be at the FMBMS spool piece flange connection. For this alignment, the high pressure FLEX pump is staged on the Auxiliary Building roof. Suction to the pump is provided by a submersible pump lowered into the RWST and the pump discharge is routed to the FMBMS spool piece flange connection.	<u>FMBMS Connection Modification</u> • Adapter and hose connection at spool piece flange connection to FMBMS <u>RWST modifications:</u> • None	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. This connection is located inside the Auxiliary Building. The Auxiliary Building is a safety related structure and is protected from all external hazards except flooding. The FMBMS connection is located above the PMF.

Notes:

1. System modifications are described in the "Modifications" section above and are illustrated in Attachment 3.
2. N high pressure FLEX pumps will be stored in the Auxiliary Building and N high pressure FLEX pumps will be stored in the FESB. This satisfied N+1 NEI requirements.
3. Figures A3-12 through A3-20 in Attachment 3 provides the deployment routes from the staging locations for each high pressure pump to the pump suction piping and to the primary and secondary connection points on the RCS connected systems.

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 methods (Low Leak RCP Seals and/or 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; however, borated sources are limited. 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. For Phase 3, Sequoyah will continue the Phase 2 coping strategies with additional assistance provided from offsite equipment/resources. Backup or alternate Phase 2 FLEX equipment will be provided by the RRC as necessary. Sequoyah will determine where Phase 3 equipment will be staged (Open item OI 5).	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available. Finally, Sequoyah will include in procedures notification of the RRC to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities.
Identify modifications	Each of the Phase 3 strategies will utilize common connections 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. Pressurizer Level

Maintain RCS Inventory Control	
PWR Portable Equipment Phase 3:	
	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 are the 125 Vdc Vital Battery. *This instrumentation is only 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 only available until flood water enters the auxiliary instrument room (OI 26). The potential validating indicator for CETs is RCS HL. This substitution is allowed by guidance provided in Reference 16. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.

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*
A mobile boration system would enable borated water to be produced using the non-borated water sources that are available at Sequoyah. This unit would combine the purified non-borated water from the mobile water purification system and boron with a mixing mechanism to discharge a desired concentration of borated water which could be used to makeup	Each of the Phase 3 strategies will utilize common connections as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The discharge connections will be 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.

Maintain RCS Inventory Control		
PWR Portable Equipment Phase 3:		
to the BATs or RWST. This unit would have an internal pump and be locally powered.		
Notes: None		

Maintain Containment
Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • **Containment Spray** • **Hydrogen igniters (ice condenser containments only)**
PWR Installed Equipment Phase 1:
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain containment. Identify methods (containment spray/Hydrogen igniter) and strategy(ies) utilized to achieve this coping time. Sequoyah will perform 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 will be developed (Open Item OI 4). 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 EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available.
Identify modifications	N/A
Key Containment Parameters	*List instrumentation credited 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 125 Vdc Vital Battery. **This instrumentation is only available until flood water enters the technical support center (TSC) inverter or station battery rooms (Open

[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.

Maintain Containment	
	Item OI 10). Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.
Notes: None	

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 methods (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time. Sequoyah will perform 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 will be developed (Open Item OI 4). Additionally, the 225 kVA 480 Vac DGs discussed in the safety functions support section will provide power directly to the hydrogen igniter supply transformers. The onsite 3 MW DGs are available to provide power to Containment air return fans or Lower Compartment Coolers (LCCs) for containment temperature control. Cooling water would be provided to the LCCs by the onsite low pressure FLEX pump feeding the ERCW header. As the 3 MW DGs are not required to support the coping strategies, but rather long-term cooling strategies, additional details are not included in this submittal.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available.
Identify modifications	Power capability will be installed to the hydrogen igniter supply transformers.
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 125 Vdc Vital Battery. **This instrumentation is only available until flood water enters the TSC inverter or station battery rooms (Open Item OI 10).

Maintain Containment		
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**		
Seismic	The 225 kVA 480 Vac DGs will be pre-staged on the roof of the Auxiliary Building. A protection structure will be built around the DGs, which will be designed to 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.	
Flooding	The 225 kVA 480 Vac DGs will be pre-staged on the roof of the Auxiliary Building, 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 225 kVA 480 Vac DGs will be pre-staged on the roof of the Auxiliary Building. A protection structure will be built around the DGs, which is sited in a suitable location that is protected from Nuclear Regulatory Commission (NRC) region 1 tornado, missiles, and velocities as defined in NRC Regulatory Guide 1.76 Revision 1.	
Snow, Ice, and Extreme Cold	The 225 kVA 480 Vac DGs will be pre-staged on the roof of the Auxiliary Building. A protection structure will be built around the DGs, and will be evaluated for snow, ice and extreme cold temperature effects and heating will be provided as required to assure no adverse effects on the FLEX equipment.	
High Temperatures	The 225 kVA 480 Vac DGs will be pre-staged on the roof of the Auxiliary Building. A protection structure will be built around the DGs, and will be evaluated for high temperature effects and ventilation will be 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 will be repowered by the 225 kVa 480 Vac DGs that will be pre-staged on the	Diverse transfer switches will be installed which directly supply the	The protection structure for the 225 kVa 480 Vac DGs and the diverse transfer switches will be

Maintain Containment		
roof of the Auxiliary Building. Cabling will be routed from the generators to one of the diverse transfer switches that will be installed.	hydrogen igniter transformers.	designed and installed such that each is 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 methods (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time. Sequoyah will perform 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 will be developed (Open Item OI 4). Additionally, the hydrogen igniters would continue to be repowered by the 225 kVa 480 Vac or 3 MW DGs. A backup or alternate set of Phase 2 equipment will be provided by the RRC as needed.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available. Finally, Sequoyah will include in procedures notification of the RRC to arrange for delivery and deployment of offsite equipment and sufficient supplies of commodities.
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 are the 125 Vdc Vital Battery. **This instrumentation is only available until flood water enters the TSC inverter or station battery rooms. (Open Item OI 10) Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.
Deployment Conceptual Modification **(Attachment 3 contains Conceptual Sketches)**	

Maintain Containment		
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 and connection points will be designed to meet or exceed Sequoyah 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
Determine Baseline coping capability with installed coping[5] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • **Makeup with Portable Injection Source**
PWR Installed Equipment Phase 1:
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. Based on the analysis results completed in Reference 11, Reference 10 summarizes that there will be no volume lost from the spent fuel pool (SFP) due to sloshing. 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 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 29 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. <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 25 hours as summarized in Reference 10. In order to keep the pool at a constant level of coolant (thus covering the top of the spent fuel), the low pressure FLEX pump will pressurize the ERCW headers to provide makeup to prevent a decrease in the level of the SFP.
Details:

[5] 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.

Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support implementation of this strategy, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available.
Identify modifications	N/A
Key SFP Parameter	The implementation of this parameter will align with the requirements of by NRC Order EA 12-051. This instrument will have initial local battery power, with the capability to be powered from the FLEX 480 Vac generators. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.
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. SFP cooling through makeup and spray will be provided by using a FLEX pump to inject coolant directly into the pool, into existing SFP cooling piping, or spray the coolant into the pool using portable FLEX spray nozzles.

Operating, pre-fuel transfer or post-fuel transfer

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 37 hours for an SSE seismic event with an initial bulk water temperature in the pool of 100°F, as summarized in Reference 10. This value was calculated using the normal operating decay heat load.

Fuel in Transfer or Full Core Offload

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 25 hours, as summarized in Reference 10.

To provide an unlimited supply of water for SFP makeup during Phase 2, a low pressure FLEX pump will be used to pressurize the ERCW headers which can then be used for makeup to the SFP using hoses.

The primary SFP makeup flow method is from the ERCW header valves located on the refueling floor through hoses directly to the open SFP. The secondary SFP makeup flow method is from the ERCW header connections through a hose to a new connection added to the SFP makeup line from the Demineralized Water System (DWS). This alignment provides makeup control when the refueling floor is not accessible. Both connections can be used during both flood and non-flood conditions.

For long term cooling of the SFP, Sequoyah intends to repower one train of normal pool cooling equipment at each unit. This will include the use of the low pressure FLEX pump on site to provide flow to the CCS heat exchanger and the onsite 3 MW DGs to repower both the CCS and SFP cooling pumps. As the 3 MW DGs are not required to support the coping strategies, but rather long-term cooling strategies, additional details are not included in this submittal.

Maintain Spent Fuel Pool Cooling	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available.
Identify modifications	*List modifications* 1. All modifications described for other functions to allow suction to be taken from the CST, RWST, or other surviving tanks will apply to this function. 2. An adapter and Storz connection will be installed at two ERCW supply valves on the SFP elevation to supply direct makeup and spray flow to the pool. 3. The secondary connection will require a new tee, with an upstream isolation valve, a branch line, and quick connect capability, to be installed on the DWS piping leading to the SFP. 4. Modifications required to pressurize the ERCW headers are described under Phase 2 Maintain Core Cooling and Heat Removal.
Key SFP Parameter	The implementation of this parameter will align with the requirements of by NRC Order EA 12-051. This instrument will have initial local battery power, with the capability to be powered from the FLEX 480 Vac generators. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	Portable equipment required to implement this FLEX strategy will be maintained in the FESB, which will be designed for seismic loading in

Maintain Spent Fuel Pool Cooling	
	excess of the minimum requirements ASCE 7-10.
Flooding	Portable equipment required to implement this FLEX strategy will be maintained in the FESB, which is designed to meet or exceed the licensing basis high wind hazard for Sequoyah.
Severe Storms with High Winds	Portable equipment required to implement this FLEX strategy will be maintained 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 4, Section 3.8.1.3).
Snow, Ice, and Extreme Cold	The FESB will be evaluated for snow, ice and extreme cold temperature effects and heating will be provided as required to assure no adverse effects on the FLEX equipment. The FESB will have a standalone HVAC system.
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.

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 primary method is flow from the ERCW headers at two 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 A3-23 through A3-25. The system connection point can be found in	<u>Primary Method Modification</u> An adapter with hose connection will be installed at the ERCW supply valve to the CCS surge tank flood condition spool piece. <u>ERCW Modifications</u> The same modifications required to pressurize ERCW headers are described under Phase 2 Maintain	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The primary connection is in the Auxiliary Building, which is seismically qualified and missile protected. The primary connection is above the PMF. Protection of CST, RWST, and

Maintain Spent Fuel Pool Cooling		
Attachment 3, Figure A3-21. Note that SFP spray would be routed in an identical manner; however, the end of the hose would have the spray nozzle installed. An alternate supply to the SFP can be provided using transfer pumps from the RWST, CST or other surviving tanks by routing hoses to the SFP elevation. This strategy is for non-flood conditions only. ERCW connections can be found in Attachment 3, Figures A3-26 and A3-27.	Core Cooling and Heat Removal. <u>CST, RWST and other surviving tanks Modifications:</u> All modifications described for other functions to allow suction to be taken from the CST, RWST, or other surviving tanks will apply to this function.	other surviving tanks is described under Phase 2 Maintain Core Cooling and Heat Removal.
The secondary SFP connection will be to the DWS makeup line in the auxiliary building. FLEX hose will be routed from this location, across the floor to the ERCW cleanout port connections. An alternate supply involves routing fire hose from either the RWST, CST, or other surviving tanks to the SFP floor. This strategy is for non-flood conditions. The proposed hose routing for the secondary connection and the associated equipment can be found in Attachment 3, Figure A3-23 through A3-25. The system connection point can be found in Attachment 3, Figure A3-22. ERCW connections can be found in Attachment 3, Figures A3-26 and A3-27.	<u>Secondary Connection Modification</u> • A tee will be added to the DWS makeup line to the SFP • An isolation valve will be added to the main line upstream of the connection. • An isolation valve will be added to the new branch. • Storz cap/adapter will be added to the new branch. <u>CST, RWST, ERCW or other surviving tanks Modifications</u> The modification for these sources would be the same as for the primary method for this function. In addition, the modification to add a hose connection 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.	All FLEX equipment and connection points will be designed to meet or exceed Sequoyah design basis SSE protection requirements. The connection point is on the exterior of the Auxiliary Building, which is seismically qualified and missile protected. Hose routing to the secondary connection will be performed before flood conditions make the area inaccessible and a hose throttle valve will be provided above the PMF. Connections to the ERCW, CST, RWST and other surviving tanks have been described in Phase 2 Reactor Core Cooling and Heat Removal.

Maintain Spent Fuel Pool Cooling
Notes: 1. System modifications are described in the "Modifications" section above and are illustrated in Attachment 3. 2. Figures A3-23 through A3-25 in Attachment 3 provide the hose routes 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. As mentioned for the Reactor Core Cooling and Heat Removal function, a mobile water purification unit will be received from the RRC to provide continued purified water to support this function. Additionally, as mentioned for the Maintain RCS Inventory Control function, a mobile boration unit will be received from the RRC to provide continued borated coolant to support this function, if required. Sequoyah will determine where Phase 3 equipment will be staged (Open item OI 5). Also, a backup or alternate set of Phase 2 equipment will be provided by the RRC as needed.	
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available. Finally, Sequoyah will include in procedures notification of the RRC to arrange for delivery and deployment of offsite equipment and sufficient supplies of commodities.
Identify modifications	N/A
Key SFP Parameter	The implementation of this parameter will align with the requirements of by NRC Order EA 12-051. This instrument will have initial local battery power, with the capability to be powered from the FLEX 225 kVa 480 Vac generators.
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**	

Maintain Spent Fuel Pool Cooling		
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 boration unit and water purification system will be the same as was mentioned for the other functions.	The description for the mobile boration unit and water purification system will be the same as was mentioned for the other functions.	The description for the mobile boration unit and water purification system will be the same as was mentioned for the other functions.
Notes: None		

Safety Functions Support	
Determine Baseline coping capability with installed coping[6] 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. Sequoyah will rely on existing installed vital batteries to power key instrumentation and emergency lighting. To extend run time before recharging is possible; a load-shedding procedure will be implemented with the first phase of load shed complete by 45 minutes and the extended load shed complete by 90 minutes. A battery coping calculation will be performed to demonstrate that the battery coping time is 8 hours (OI 25). Preliminary analysis using conservative heat loads in the Auxiliary and Control Buildings has shown that installed equipment credited for mitigation response will remain available. In addition, accessibility of these areas for required actions is acceptable.	
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 EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available.
Identify modifications	*List modifications and describe how they support coping time.* N/A

[6] 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.

Key Parameters	*List instrumentation credited for this coping evaluation phase.* 1. DC Bus Voltage For all instruments listed above the normal power source and the long-term power source are the 125 Vdc Vital Battery. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.
Notes: None	

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. The primary electrical need during Phase 2 is DC power for critical instrumentation. This will be accomplished by energizing the support power system and energizing battery chargers on both A and B trains in both Units 1 and 2. The on-site 225 kVA 480 Vac FLEX DGs are pre-staged to provide power to the 125 Vdc vital battery which feeds the 120 Vac vital inverter power systems. These generators will be pre-staged on the Auxiliary Building roof and will be protected from the external hazards with an adequate supply of fuel for 8 hours of operation. The 225 kVA 480 Vac FLEX DGs will be connected to the battery chargers to power the DC and AC Vital Power System. Additionally, the onsite 3 MW DGs are pre-staged to provide power to the existing 6.9 kV distribution system. The 3 MW DGs may also serve as an alternative power source for the loads supplied by the on-site 225 kVA 480 Vac FLEX DGs. Further analysis will be performed to determine the required timeline for this alternate strategy (Open Item OI 24). These generators will be staged in the FESB and protected from the external hazards discussed in this document. As the 3 MW DGs are not required to support the coping strategies, but rather long-term cooling strategies, additional details are not included in this submittal.
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,

Safety Functions Support	
PWR Portable Equipment Phase 2	
	including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available.
Identify modifications	For the 225 kVa 480 Vac DGs, two fused distribution panels will be used to provide power to the supplied loads. Each fuse panel provides connections to two vital battery chargers and one train of hydrogen igniter transfer switches for each unit. Each fuse distribution panel will have a connection to 480 Vac distribution to close Cold Leg Accumulator Isolation valves during cooldown. Fuel for the 225 kVa 480 Vac DGs will be provided by the installed DG 7-day tanks. Fuel lines will be installed between the 7-day fuel tanks mounted under the DG Building and Auxiliary Building roof to provide fuel to the 225 kVa 480 Vac DGs with a fuel transfer pump. To connect the existing 6.9 kV system to the 3 MW DGs during FLEX operation, the connection to the existing safety-related DG circuit is opened and the circuits to the 3 MW generators are closed by operating the existing interlocked transfer switches 1A-A, 1B-B, 2A-A, or 2B-B. This will be done under administrative controls, ensuring that a no-load condition exists on the load side of the transfer switches. The permanently installed electrical connection points for the 3 MW DGs are from the DGs' integral output connection panel through conduits within the FESB to underground conduits located on the outside of the FESB wall. One 3 MW DG will be assigned to Train A on both units and the second 3MW DG will be assigned to Train B of both units. The conduits will 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 3MW DGs will be accomplished using a separate fuel transfer pump dedicated for the purpose of transferring fuel from the 7-day tanks to the 3MW DGs' fuel oil day tanks. As the 3 MW DGs are not required to support the coping strategies, but rather long-term cooling strategies, additional details are not included in this submittal.

Safety Functions Support	
PWR Portable Equipment Phase 2	
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* • DC Bus Voltage For the instrument listed above the normal power source and the long-term power source are the 125 Vdc Vital Battery. Sequoyah will develop procedures to read this instrumentation locally, where applicable, using a portable instrument as required by Section 5.3.3 of NEI 12-06.
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 Auxiliary Building, or on the Auxiliary Building roof. 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 Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	Equipment for this function will either be stored or pre-staged in the FESB, in the Auxiliary Building, or on the Auxiliary Building roof. 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 Auxiliary Building, or on the Auxiliary Building roof. 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 Auxiliary Building, or on the Auxiliary Building roof. 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 Auxiliary Building, or on the Auxiliary Building roof. The

Safety Functions Support		
PWR Portable Equipment Phase 2		
	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.	
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.	The modifications for this function are described in the Identify Modifications section.	The protection structure for the 225 kVa 480 Vac DGs will be designed and installed such that each is protected from the five external hazards, as described in this section. The fuse distribution panels for the 225 kVa 480 Vac DGs will be located inside the Auxiliary Building which will provide protection from the external hazards, as described in this section.
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. A backup or alternate set of Phase 2 equipment will be provided by the RRC, as needed. Sequoyah will determine where Phase 3 equipment will be staged (Open Item OI 5).		
Details:		
Provide a brief description of Procedures / Strategies / Guidelines	Procedures and guidance to support deployment and implementation, including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be developed in accordance with NEI 12-06, Rev. 0, Section 11.4. Further, the PWROG has developed generic guidance, and Sequoyah's strategy aligns with the generic guidance and will consider the NSSS specific guidance once available. Finally, Sequoyah will include notification of the RRC in plant procedures to arrange for delivery and deployment of off-site equipment and sufficient supplies of commodities.	
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 or alternate set of Phase 2 equipment will be provided by the RRC, as needed.	Each of the Phase 3 strategies will utilize common connections as described for the Phase 2 connections to prevent any compatibility issues with the offsite equipment.	There are no connection points for this strategy. All equipment will be provided by offsite resources.

Safety Functions Support
PWR Portable Equipment Phase 3
Notes: None

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*[7]	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Three Intermediate Pressure FLEX Pumps (Core Cooling Makeup)	**X**					346 gpm 942 ft total dynamic head (TDH) Diesel Driven	Will follow EPRI template requirements
Four High Pressure FLEX Pumps (RCS Makeup)	**X**					10 gpm 3561 ft TDH 480 Vac	Will follow EPRI template requirements
Two Water Transfer pumps	**X**		**X**			500 gpm 247 ft TDH Diesel Driven	Will follow EPRI template requirements
Two Low Voltage Diesel Generators	**X**	**X**	**X**	**X**	**X**	480V 225kVA	Will follow EPRI template requirements
Tow Vehicle	**X**		**X**		**X**	Capable of on-site transport of 14,000 Gross Vehicle Weight (GVW) trailer	Will follow EPRI template requirements

[7] Performance criteria of FLEX equipment is conservative and was determined during conceptual design as a basis for the selection of required FLEX equipment. The criteria will be re-analyzed during the detailed design phase (OI 7).

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*[7]	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Fuel Transportation Equipment	**X**		**X**	**X**	**X**	500 gallons Minimum	Will follow EPRI template requirements
Three Low Pressure FLEX Pumps (Pressurizes ERCW Headers)	**X**	**X**	**X**			5000 gpm 350 ft TDH Diesel Driven	Will follow EPRI template requirements
Three Floating Booster Pumps (Supplies Low Pressure FLEX Pump)	**X**	**X**				5000 gpm 50 ft. lift Diesel Driven	Will follow EPRI template requirements
Three Submersible Pumps (Supplies Intermediate Pressure FLEX pump)	**X**					200 gpm 90 TDH 480Vac	Will follow EPRI template requirements
Three Submersible Pumps (Supplies High Pressure FLEX pump)	**X**					30 gpm 90 TDH Electrical	Will follow EPRI template requirements

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*[7]	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Two SFP Spray Nozzles			**X**			250 gpm	Will follow EPRI template requirements
Two Diesel Fuel Transfer Pumps	**X**	**X**	**X**			200 gpm Diesel Driven	Will follow EPRI template requirements
Two Medium Voltage Diesel Generator	**X**	**X**	**X**	**X**	**X**	*6900V 3MW	Will follow EPRI template requirements
Crane or other lift equipment (for staging pumps on Auxiliary Building roof)	**X**	**X**			**X**	5,000 lb. lift capacity Minimum	Will follow EPRI template requirements
Debris Clearing Equipment					**X**	Capable of clearing trees, light poles, construction materials and miscellaneous debris	Will follow EPRI template requirements

Note: Information in this table is based on the evaluations documented in Reference 11, which is expected to be representative of the conditions at Sequoyah. This will be confirmed in Sequoyah specific evaluations for the 6 month update in August 2013.

*This can be achieved with a 4160V DG and transformer to provide a 6900V source.

PWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria* [8]	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Intermediate Pressure FLEX Pumps (Core Cooling Backup) Pump	**X**					346 gpm 942 ft TDH Diesel Driven	Will follow EPRI template requirements
High Pressure FLEX Pump Backup	**X**					10 gpm 3561 ft TDH 480Vac	Will follow EPRI template requirements
Water Transfer Pump Backup	**X**		**X**			500 gpm 247 TDH Diesel Driven	Will follow EPRI template requirements
Low Voltage Diesel Generators Backup	**X**	**X**	**X**	**X**	**X**	480V 225kVA	Will follow EPRI template requirements
Medium Voltage Diesel Generator Backup [9]	**X**	**X**	**X**	**X**	**X**	*6900V 3MW	Will follow EPRI template requirements
Low Pressure FLEX Pump Backup	**X**	**X**	**X**			5000 gpm 350 ft TDH Diesel Driven	Will follow EPRI template requirements

[8] Performance criteria of FLEX equipment is conservative and was determined during conceptual design as a basis for the selection of required FLEX equipment. The criteria will be re-analyzed during the detailed design phase (OI 7).

[9] It is expected the Phase 3 medium voltage generator provided by the RRC will be 4160V. A transformer will need to be included to step up to 6900V.

*This can be achieved with a 4160V diesel generator and transformer to provide a 6900V source.

PWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria* [8]	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Submersible Pump Backup (Supplies Intermediate Pressure FLEX pump)	**X**					200 gpm 90 TDH 480Vac	Will follow EPRI template requirements
Submersible Pump Backup (Supplies High Pressure FLEX pump)	**X**					30 gpm 90 TDH Electrical	Will follow EPRI template requirements
Backup Diesel Fuel Transfer Pumps	**X**	**X**	**X**			200 gpm Diesel Driven	Will follow EPRI template requirements
Fuel Transportation Equipment Backup	**X**		**X**	**X**	**X**	500 gallons Minimum	Will follow EPRI template requirements
Mobile Boration Unit	**X**		**X**			Open Item OI 9	This item to be developed in detailed design.
Mobile Water Purification Unit	**X**	**X**	**X**			Open Item OI 9	This item to be developed in detailed design.

Note: Information in this table is based on the evaluations documented in Reference 11, which is expected to be representative of the conditions at Sequoyah. This will be confirmed in Sequoyah specific evaluations for the 6 month update in August 2013.

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) Towers	

Commodities
• Food
    o Meals ready to eat (MRE)
    o Microwavable Meals
• Potable water	

Fuel Requirements • Diesel Fuel	
Heavy Equipment • Transportation equipment o 4 wheel drive tow vehicle • Debris clearing equipment	
Communications Equipment • Satellite Phones • Portable Radios	

Portable Interior Lighting • Flashlights • Headlamps • Batteries	
Portable Exterior Lighting • Light units with diesel generator	

References

1. NRC EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," March 12, 2012. [ADAMS Accession Number ML12054A735]
2. NEI 12-06, Revision 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," August 2012.
3. NRC JLD-ISG-2012-01, Revision 0, "Compliance with Order EA-12-049, 'Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,'" August 2012.
4. Sequoyah Nuclear Plant Updated Final Safety Analysis Report (UFSAR), Amendment No. 23.
5. LAR SQN-TS-12-02, "Application to Revise Sequoyah Nuclear Plant Units 1 and 2 Updated Final Safety Analysis Report Regarding Changes to Hydrologic Analysis", August 10, 2012 (Accession No. ML12226A561).
6. Not Used.
7. WCAP-17601-P, Revision 1, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering, and Babcock & Wilcox NSSS Designs," PWROG Project PA-ASC-0916, January 2013.
8. Not used.
9. TVA Drawings
    a. 46W501-2, Revision 2, Architectural Plan El 685.0 & 690.0.
    b. 46W501-3, Revision 4, Architectural Plan El 706.0 & 714.0.
    c. 46W501-4, Revision 0, Architectural Plan El 732.0 & 734.0.
    d. 46W501-5, Revision 3, Architectural Plan El 749.0 & 759.0.
    e. 47W200-1, Revision 2, Equipment Plans - Roof
    f. 10N200-1, Revision F, General Plan.
10. TR-FSE-13-13, Revision 0, "Sequoyah Integrated Plan," February 2013.
11. TR-FSE-13-1, Revision 2, "Watts Bar Integrated Plan," February 2013.
12. Task Interface Agreement (TIA) 2004-04, "Acceptability of Proceduralized Departures from Technical Specifications (TSs) Requirements at the Surry Power Station," (TAC Nos. MC4331 and MC4332)," dated September 12, 2006. [Accession No. ML060590273]
13. OG-12-482, Revision 0, "Transmittal of PA-PSC-0965 Core Team PWROG Core Cooling Management Interim Position Paper," November, 2012.
14. FLEX Implementation HVAC Analysis Impact Study, Project No. 12938-012
15. Not Used.
16. OG-12-515, "Transmittal of Final Generic PWROG FLEX Support Guidelines and Interfaces (Controlling Procedure Interface and Recommended Instruments) from PA-PSC-0965," Revision 0, December 2012.
17. ECA-0.0, Revision 25, Loss of All AC Power.
18. EA-250-1, Revision 15, Load Shed of Vital Loads After Station Blackout.

Open Items

OI 1. The current 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.

OI 2. Liquefaction of haul routes for FLEX will be analyzed.

OI 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.

OI 4. No need time has been identified for action to protect containment. This includes 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.

OI 5. A determination of where the Phase 3 equipment will be staged will be performed.

OI 6. A strategy for clearing and removing debris will be determined.

OI 7. A thorough analysis of the makeup flow rate requirements and other equipment characteristics will be performed during the detailed design phase of FLEX.

OI 8. The need time for 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.

OI 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.

OI 10. Containment temperature instrumentation is only available until flood waters enter the TSC inverter or station battery room. Requirements for NSSS-specific FSGs for containment temperature, as noted in Appendix F of Reference 10, are pending further evaluation. A method to monitor containment temperature, post-flood, will be developed.

OI 11. The HVAC analysis (Reference 14) is preliminary analysis, and has not been finalized.

OI 12. Verify ability to deploy FLEX equipment to provide core cooling in Modes 5 and 6 with SGs unavailable.

OI 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.

OI 14. Perform an alternate cooling source evaluation. The purpose of this analysis is to examine options to utilize alternate water sources to provide continuous sources of water to maintain key safety functions.

OI 15. Perform conceptual hydraulic performance analyses. The purpose of this analysis is to conservatively evaluate hydraulic performance of FLEX systems.

OI 16. Develop a mechanical conceptual design report. The purpose of this report is to summarize the mechanical conceptual design of the FLEX strategies and identify any required modifications.

OI 17. Perform an electrical conceptual design report. The purpose of this report is to summarize the electrical conceptual design of the FLEX strategies and identify any required modifications.

OI 18. Perform an RCS makeup analysis. The purpose of this analysis is to define FLEX RCS inventory and shutdown margin for Sequoyah.

OI 19. Perform an SFP evaluation. The purpose of this analysis is to evaluate the impact of sloshing and time-to-boil in the SFP after an earthquake.

OI 20. Perform a timing and deployment evaluation. The purpose of this analysis is to summarize the FLEX timeline for Sequoyah, identify time constraints and provide for the safety function needs.

OI 21. Develop a programmatic control report. The purpose of this report is to summarize the need to implement programmatic control of the FLEX program.

OI 22. Evaluate the existing extreme hazard analysis and planned Near-Term Task Force (NTTF) Tier 1 activities on FLEX strategies to summarize on-going industry activities and the potential to impact the developed FLEX strategies.

OI 23. The time at which the Forebay volume depletes needs to be evaluated to determine the time at which replenishment is required. Based on Reference 10 there is 1,640,000 gallons available in the Forebay. Based on the Watts Bar alternate cooling source evaluation, approximately 640,000 gallons are required at 72 hours post ELAP. Therefore, it is expected the Forebay volume will supply suction to the TDAFWP for greater than 72 hours following the ELAP event and replenishment will be required during Phase 3.

OI 24. Further analysis will be performed to determine the required timeline for implementing the 3 MW DGs as an alternate power source for the loads supplied by the 225 kVA 480 Vac DGs.

OI 25. Complete battery calculations to document Vital Battery life of 8 hours after loss of all AC. A battery calculation has been completed for WBN which is of smilar design.

OI 26. 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.

OI 27. Strategies to address extreme cold conditions on the RWST and/or BATs, including potential need to reenergize heaters, have not been finalized.

OI 28. Establish a contract with the SAFER team in accordance with the requirements of Section 12 of Reference 2.

Acronyms

AB	auxliliary building
ABMT	auxiliary boration makeup tank
ac	alternating current
ACR	auxiliary control room
ACS	alternate cooling source
AFW	auxiliary feedwater
AOP	abnormal operating procedure
AOV	air-operated valve
APM	available physical margin
ARV	atmospheric relief valve
AUO	assistant unit operator
BAT	boric acid tank
BCS	backup control station
BDB	beyond-design-basis
BDBEE	beyond-design-basis external events
CCS	component cooling system
CCW	condenser circulating water
CFR	Code of Federal Regulations
CFT	core flood tank
CLA	cold leg accumulator
CLB	cold leg break
CST	condensate storage tank
CVCS	chemical and volume control system
CWST	cask washdown storage tank
DBE	design basis event
DBFL	design basis flood level
dc	direct current
DG	diesel generator
DGB	diesel generator building
DWHT	demineralized water head tank
DWS	demineralized water system
DWST	demineralized water storage tank
EDG	emergency diesel generator
EDMG	extreme damage mitigation guideline
EFW	emergency feedwater
ELAP	extended loss of ac power
EOI	emergency operating instruction
EOP	emergency operating procedure
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
HCLPF	high confidence of low probability failure
HPFP	high pressure fire protection
HVAC	heating, ventilation, and air conditioning
IER	Industry Event Report
INPO	Institute of Nuclear Power Operations
IPS	intake pumping station
ISG	Interim Staff Guidance
LCV	level control valve
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
LUHS	loss of normal access to the ultimate heat sink
MCC	Motor Control Center
MCR	main control room
MDAFWP	motor driven auxiliary feedwater pump
MOV	motor operated valve
MRE	meals ready to eat
MSL	mean sea level
NEI	Nuclear Energy Institute
NPSH	net positive suction head
NRC	Nuclear Regulatory Commission
NSSS	nuclear steam supply system
NTTF	Near-Term Task Force
OBE	Operating Basis Earthquake
PORV	power operated relief valve
PMF	probable maximum flood
PMP	probable maximum precipitation
PWR	pressurized water reactor
PWROG	Pressurized Water Reactor Group Owners Group
PWST	primary water storage tank
QR	quality related
RCP	reactor coolant pump
RCS	reactor coolant system
RHR	residual heat removal
RRC	Regional Response Center
RSO	River Systems Operations
RWST	refueling water storage tank
RWT	raw water tank
SAFER	Strategic Alliance for FLEX Emergency Response
SAMG	severe accident management guideline
SBO	station blackout
SDB	shutdown board
SFP	spent fuel pool
SG	steam generator

SIP	safety injection pump
SIS	safety injection system
SIT	safety injection tank
SR	safety related
S/RV	safety/relieve valve
SSC	systems, structures and components
SSE	safe shutdown earthquake
TD	turbine-driven
TDH	total dynamic head
TDAFWP	turbine driven auxiliary feedwater pump
TOAF	top of active fuel
TSC	technical support center
TVA	Tennessee Valley Authority
UFSAR	updated final safety analysis report
UHS	ultimate heat sink

Attachment 1A

Sequence of Events Timeline

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
	0	Event Starts	NA	NA	Reference 11	Plant @100% power
	0	SBO	N	NA	Reference 11	ECA-0.0 (Reference 17)
1	0	Initial Load Shed	N	0.75	Reference 18	Completed within 45 minutes (0.75 hours) following the start of the event. EA-250-1 (Reference 18)

[1] Elapsed time is defined as the time from the loss of power due to the external event until the action is initiated. These times are conceptual and will be refined as FLEX strategies are verified.

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
2	0.75	Declare ELAP	Y	1.0	Reference 11	ELAP entry conditions can be verified by control room staff and it is validated by EDGs not available. This step is time sensitive because entry into ELAP provides guidance to operators to perform ELAP actions. ELAP will be declared within 1 hour.
3	0.75	Extended Load Shed	Y	1.5	Reference 11	Completed within 90 minutes (1.5 hours) following the start of the event. This consists of additional load shedding such that generally, only FLEX required loads remain powered.

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
4	2	Debris Removal (Access)	Y	12	Reference 11	Deployment paths will need to be cleared, to the extent necessary, to align the low pressure FLEX pump to the ERCW headers and RCS makeup pump staging. (Open Item OI 6)
5	3	Perform Damage Assessment	Y	6	Reference 11	Provide status of essential plant SSCs to inform FLEX strategies. This assessment will determine what strategies and water sources will be required.
6	6.5	Align RCS Make-up Pump from BAT (Boration)	Y	8	Reference 11	Plant cooldown commences at 8 hours. Time also allows adequate time for boration injection from the BAT. Time based on installation of 4 SHIELD® seals and not having to start cooldown until 8 hours.

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
7	6	Deploy Hoses to SFP Area	Y	6.9	Reference 11	Need time based on SFP time to boil off occurs.
8	6	Vent SFP area	Y	6.9	Reference 11	Need time based on SFP time to boil off occurs.
9	7	Align 225 kVA 480 Vac Generator	Y	8	Reference 11	Earliest need for generator is 8 hours.
10	8	Perform plant cooldown	Y	12	Reference 11	Based on installation of 4 SHIELD® seals, a cooldown start time of 8 hours and duration of less than 4 hours. RCS make-up must be initiated by 9.3 hours from the BAT for boration. RCS make-up is initiated at the start of the cooldown at 8 hours to make up for shrinkage.
11	9	Validate Alternate Fuel Supply	Y	11	Reference 11	Depletion of FLEX fuel supplies for pumps (8 hours + equipment deployment time).

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
12	8	Align SG makeup from the ERCW system piping	Y	10	Reference 11	CST will be depleted in 10 hours, at which point the standing water in the ERCW headers will be used. The ERCW headers will need to be aligned prior to these both depleting.
13	8.5	Control Room (CR) Lighting	N	NA	Reference 11	CR lighting is available via batteries, ensure portable lighting is available for required activities.

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
14	10.5	Align charging of the ERCW System Header	Y	28.5	Reference 11	CST will be depleted in 10 hours plus 18.5 hours of standing water inventory in the ERCW headers (Reference 10). It is noted the timeline is based on the Watts Bar analysis. A Sequoyah site-specific analysis is to be performed to support the Sequoyah site-specific values (Open Item OI 20). The low pressure FLEX pump will need to be aligned to the ERCW headers to provide charging prior to both of these sources depleting.
15	21.5	Align RCS make-up pump from RWST (Long term inventory control)	Y	24.0	Reference 11	Boration from the BAT will be finished by 24 hours. Makeup source is then switched to the RWST for flooded conditions for long term inventory control.

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
16	22	Stage SG Make-up Pump from the ERCW System Header	Y	24.0	Reference 11	TDAFWP is not anticipated to fail catastrophically. Back-up should be staged as soon as time and resources permit.
17	24	Establish HVAC / Fan Cooling Battery/Switchgear Room	N	24.0	Reference 11	HVAC study (Reference 14) determined this action not required until 24 hours into ELAP event; at which point it can be monitored periodically if needed.
18	24	Main Control Room Ventilation	N	24.0	Reference 11	Action completed by opening Main Control Room rear panel. HVAC study (Reference 14) determined this action not required until 24 hours into ELAP event; at which point it can be monitored periodically if needed.

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
19	24	TDAFWP Room Ventilation	N	24.0	Reference 11	HVAC study (Reference 14) determined this action not required until 24 hours into ELAP event; at which point it can be monitored periodically if needed.
20	30	Align Mobile Water Purification System	Y	72.0	Reference 11	10 hours of CST + 62 hours of ERCW system (further evaluation required to extend).
21	36	Align SFP Make-up via ERCW headers.	Y	37.0	Reference 11	Time to boil plus 104 ft^3 of water per inch in the pool, from lowest pipe penetration level to 10 ft above the fuel at 70 gpm.
22	38	Align Mobile Boration Unit	Y	>72.0	Reference 11	RWST will provide source for more than 72 hours.

Action item	Elapsed Time[1] (hours)	Action	New ELAP time constraint Y/N	Time Constraint (hours)	Time Constraint Reference	Remarks / Applicability
23	40	Align Large Generators	Y	>72.0	Reference 11	Action initiated to deploy generator to support repowering various installed pumps to provide indefinite coping capability.
24	58	Establish Large Fuel Truck Service	Y	>72	Reference 11	Onsite fuel supplies last greater than 72 hours.
TBD	>72	Establish Forebay Volume Replenishment	Y	>72	Reference 10	Forebay inventory lasts greater than 72 hours. Need time for replenishment to be determined per Open Item OI 23.

Note: Information in this table is based on the analysis results documented in Reference 11, which is expected to be representative of the conditions at Sequoyah. This will be confirmed in Sequoyah specific analyses for the 6 month update in August 2013.

Attachment 1B

NSSS Significant Reference Analysis Deviation Table

Item	Parameter of interest	WCAP value (WCAP-17601-P January 2013 Revision 1)	WCAP page	Plant applied value	Gap and discussion
There are no deviations.					

Attachment 2

Milestone Schedule

The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent 6 month status reports.

Activity	Original Target Date	Status (Will be updated every 6 months)
Submit Overall Integrated Implementation Plan	**2/28/2013**	
6 Month Status Updates		
Update 1	**Aug-2013**	
Update 2	**Feb-2014**	
Update 3	**Aug-2014**	
Update 4	**Feb-2015**	
Update 5	**Aug-2015**	
Update 6	**Feb-2016**	
FLEX Strategy Evaluation	**Jun-2013**	
Perform Staffing Analysis	**Jun-2014**	
Modifications		
Modifications Evaluation	**Jun-2013**	
Engineering and Implementation		
Unit 1 N-1 Walkdown	**Oct-2013**	
Unit 2 N-1 Walkdown	**Apr-2014**	
Design Engineeering		
Unit 1 Implementation Outage	**Apr-2015**	

Activity	Original Target Date	Status (Will be updated every 6 months)
Unit 2 Implementation Outage	Dec-2015	
On-Site FLEX Equipment		
Purchase	Jun-2013	
Procure	Apr-2014	
Off-Site FLEX Equipment		
Develop Strategies with RRC	Dec-2013	
Install Off-site Delivery Station (if necessary)	Apr-2014	
Procedures		
PWROG issues FSG guidelines	Jun-2013	
Create Sequoyah FSGs	Jun-2014	
Create Maintenance Procedures	Jun-2014	
Training		
Develop Training Plan	Jun-2014	
Implement Training	Dec-2014	
Submit Completion Report	Jan-2016	