Omaha Public Power District

LIC-16-0010
February 29, 2016

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

Fort Calhoun Station, Unit No. 1
Renewed Facility Operating License No. DPR-40
NRC Docket No. 50-285

Subject: Omaha Public Power District's Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

References: See Page 3

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an Order (Reference 1) to all power reactor licensees and holders of construction permits in active or deferred status. The Order was effective immediately and required the Omaha Public Power District (OPPD) to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event (BDBEE). Specific requirements are described in Attachment 2 of the Order.

Pursuant to Section IV, Condition C.2 of the Order, licensees are to provide a status report at six-month intervals following submittal of the Overall Integrated Plan (OIP), which OPPD submitted on February 28, 2013 (Reference 4). In August 2015, OPPD provided the fifth six-month status report (Reference 9) describing progress made in implementing the requirements of the Order; this letter provides the sixth six-month status report.

The OIP (Reference 4) and subsequent six-month status reports (i.e., References 5 through 9) were prepared utilizing NEI guidance (Reference 2) as endorsed with exceptions and clarifications by the NRC in Reference 3.

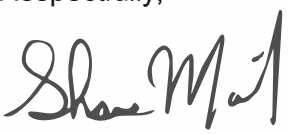
Please note that OPPD is notifying the NRC that the completion date for a Phase 2 staffing assessment commitment is being revised. Details and justification are provided in Section 3 "Milestone Schedule Status" of the enclosure to this letter.

There are no other regulatory commitments or changes to regulatory commitments contained in this submittal.

If you should have any questions regarding this submittal, please contact Mr. Bradley H. Blome at (402) 533-7270.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 29, 2016.

Respectfully,



Shane M. Marik
Site Vice President and CNO

SMM/JKG/epm

Enclosure: Six-Month Status Report for the Implementation of Order EA-12-049

c: M. L. Dapas, NRC Regional Administrator, Region IV
C. F. Lyon, NRC Senior Project Manager
P. J. Bramford, NRC Project Manager
S. M. Schneider, NRC Senior Resident Inspector

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 (ML12054A736) (NRC-12-0020)
2. Nuclear Energy Institute (NEI) 12-06, “Diverse and Flexible Coping Strategies (FLEX) Implementation Guide,” Revision 0, dated August 2012 (ML12242A378)
3. 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)
4. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), “Omaha Public Power District’s Overall Integrated Plan in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events (Order Number EA-12-049),” dated February 28, 2013 (ML13064A298) (LIC-13-0019)
5. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), "Omaha Public Power District's First Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events," dated August 28, 2013 (ML 13268A075) (LIC-13-0123)
6. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), “Omaha Public Power District’s Second Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events,” dated February 24, 2014 (ML14055A412) (LIC-14-0021)
7. Letter from OPPD (E. D. Dean) to NRC (Document Control Desk), “Omaha Public Power District’s Third Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events,” dated August 27, 2014 (ML14239A679) (LIC-14-0108)
8. Letter from OPPD (E. D. Dean) to NRC (Document Control Desk), “Omaha Public Power District’s Fourth Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events,” dated February 27, 2015 (ML15058A679) (LIC-15-0032)
9. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), “Omaha Public Power District’s Fifth Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” dated August 27, 2015 (ML15239B219) (LIC-15-0098)

Fort Calhoun Station, Unit No. 1

Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

1 Introduction

The Omaha Public Power District (OPPD) developed an Overall Integrated Plan (Reference 1)[1] documenting the diverse and flexible strategies (FLEX), in response to Reference 2. This enclosure and its attachments provide an update of milestone accomplishments since submittal of the Overall Integrated Plan, including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

2 Milestone Accomplishments

- Plant-specific NSSS/Containment Response, Control Room Heatup Calculation and Water Quality Evaluation are complete.
- FLEX Support Guideline Basis Documents and Executive volume have been issued.
- Lower Mode FLEX Support Guidelines have been issued.
- Plant-Specific FLEX Support Guidelines and Preventative Maintenance Procedures have been drafted.
- Beyond-Design-Basis (BDB) Flooding Strategy has been established for all potential flooding elevations, and associated FLEX Support Guideline has been drafted.
- FLEX Storage Building design is complete.

3 Milestone Schedule Status

Attachment 1 contains an update to the Milestone Schedule (Reference 1, Enclosure, Attachment 2) provided with the Overall Integrated Plan. The status of each milestone is shown, as are revised completion dates. The dates are planning dates subject to change as design and implementation details are developed. Attachment 1 is formatted to align with the table provided in the Nuclear Energy Institute's (NEI) Six-Month Status Report Template and supersedes the Milestone Schedule provided by Reference 1.

Based on the current outage schedule, Reactor Startup is now scheduled for November, 2016; therefore the "Full Site FLEX Implementation" milestone has been changed to November, 2016. All modification design packages are complete, except for the design of a portable electrical distribution panel and associated cabling (scheduled for completion by March 2016) and the water supply well, which had been deferred (see section 4 for details on this decision). Construction of the FLEX Storage Building has begun and is scheduled for completion in August, 2016. Based on this completion date, procurement of the FLEX portable equipment is expected to be complete in July, 2016 and Storage Implementation will occur in September, 2016. Development of the SAFER Response Plan is complete. Site specific FLEX Support Guidelines (FSGs) and Preventative Maintenance Procedures (PMs) are in final draft form, awaiting Verification and Validation (V&V) as the FLEX modifications are installed. Based on this progress, the schedule items "Create Site-Specific FSGs" and "Create Maintenance Procedures" are considered

[1] Documents referenced in this enclosure are listed in Section 8.

complete. The V & V process for these procedures is scheduled to start the week of February 29, 2016 and will be tracked under the "Walk-throughs or Demonstrations" milestone. The revised completion dates discussed above do not impact the implementation date of the Order.

In Reference 5, OPPD made a commitment to provide the Phase 2 staffing assessment, a schedule for implementing changes associated with the staffing assessment and changes that have been made or will be made to the emergency plan associated with the staffing assessment by May 1, 2016. This commitment is associated with the Milestone "Perform Staffing Analysis" shown in Attachment 1 to this enclosure. The need for significant resources from the Operations, Chemistry, and Radiation Protection departments necessitates that the completion date be extended to June 3, 2016. The revised date will not impact OPPD's ability to comply with NRC Order EA-12-049 (Reference 2), which requires full implementation no later than two (2) refueling cycles after submittal of the overall integrated plan, as required in Condition C.1.a, or December 31, 2016, whichever comes first.

4 Changes to Compliance Method

Minor changes have been made to the overall compliance method as documented in the Fort Calhoun Station Overall Integrated Plan (OIP, Reference 1) as discussed below:

The results of the control room heatup calculation (see OIP Open Item #2 in Section 6, below) show that control room cooling will not be required for a significantly longer period of time than was assumed in the Overall Integrated Plan timeline. Based on the time window established by the study, OPPD has determined that the most effective means of providing control room cooling is to re-power the safety related control room cooling units. The design for connection of a portable generator to re-power 480 VAC load centers now includes a control room cooling unit as a required load and the capacity of the portable Diesel Generators and associated portable switchgear have been sized accordingly. It was also determined that control room lighting could be restored as part of the process to restore power to a battery charger. Thus, the OIP sequence of events discussion and associated table have been revised as shown in Attachment 3 of this enclosure.

Open Items 3 and 6 of the OIP address the need to evaluate the response of the FCS NSSS as a result of modifications being undertaken as part of the FLEX program implementation. The necessary evaluations have been completed and confirm the basic assumptions of the original OIP regarding timing for makeup to the Reactor Coolant System and Containment temperature and pressure response. Additionally, these evaluations provide further insights into timing of operator actions relative to reactivity control, SIT isolation, etc. Other evaluations regarding auxiliary building environmental conditions and spent fuel pool heatup have also improved the understanding of the overall sequence of events timeline. Based on these studies, the OIP sequence of events discussion and associated table have been revised as shown in Attachment 3 of this enclosure.

As discussed in previous 6-month updates, OPPD has developed an interim strategy to address BDB flooding. This strategy is similar to that described in Reference 1, Enclosure, Appendix B, Action 24, but involves a slightly different portable equipment configuration to accommodate issues not yet addressed by FLEX modifications. The interim equipment and strategies are being incorporated into the FLEX Overall Integrated Plan. Certain modifications have been developed to improve protection and deployment of the flood mitigation equipment. The result is a minor change in the FLEX equipment described in the Overall Integrated Plan. Additionally, with the

issuance of the SAFER Response Plan, a more definitive list of SAFER equipment has been established. Based on these updates, the OIP Phase 2 and Phase 3 equipment tables have been revised as shown in Attachment 3 of this enclosure.

Also in previous 6-month updates, OPPD stated that a well would be installed as a source of makeup water redundant to the ultimate heat sink (UHS). It has been determined that since the primary purpose of installing a well is to provide a reliable source of makeup water following a BDB flood, installation will evaluated as part of the Mitigating Strategies Assessment scheduled for December 2016 as outlined in Enclosure 1 to COMSECY-15-0019. OPPD is currently evaluating the cost-benefit of deferring installation of the well until 2017. If it is decided to defer installation of a well to address the removal of the well pump as a redundant means of providing makeup water, an additional portable pump would be procured to provide "N+1" components for providing makeup water from the UHS. This potential change in makeup strategy is reflected in Attachment 2 of this enclosure.

None of the changes discussed above significantly change the overall FLEX strategies described in Ref. 1. While these changes have a minor impact in numerous locations of the OIP, the net effect is captured in Attachment 3. Therefore, no attempt is being made at this time to update the entire OIP to reflect these changes. The as-built configuration will be provided in the FCS FLEX program document and the Final Implementation Plan submitted with the letter confirming FCS is in compliance with NRC order EA-12-049 (Reference 2).

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

OPPD expects to comply with the Order's implementation date and no relief/relaxation is required at this time.

6 Open Items from Overall Integrated Plan and Draft Safety Evaluation

The following tables provide a summary of the open items documented in the Overall Integrated Plan (Reference 1) or the Draft Safety Evaluation (SE) and the status of each item.

Overall Integrated Plan Open Item	Status
1. Communicate exceptions related to Site Security Plan or Other License requirements	Started
2. Complete Control Room Heatup Calculation	Complete
3. Complete Reactor Coolant System (RCS) Makeup Evaluation with Reactor Coolant Pump (RCP) Controlled Bleed-off (CBO) Modification	Complete
4. Develop Playbook (SAFER Response Plan)	Complete
5. Complete Water Chemistry Impact Analysis and review impact on the strategies	Complete
6. Complete Core Uncovery Time Evaluation with RCP CBO Isolation. (This is subtask of Open Item #3.)	Complete
7. Evaluate Auxiliary Building Ventilation Requirements with Spent Fuel Pool (SFP) Evaporation	In final approval process

8. Evaluate Environmental Conditions after Extended Loss of AC Power (ELAP) in critical FLEX deployment areas	In final approval process

Draft Safety Evaluation Open Item	Status
Interim Staff Evaluation (ISE) received on February 27, 2014 (Reference 3).	Attachment 2 of this enclosure describes the status of the Open Items and Confirmatory Items from the ISE.

7 Potential Draft Safety Evaluation Impacts

There are no potential impacts to the Draft Safety Evaluation identified at this time.

8 References

The following references support the updates to the Overall Integrated Plan described in this enclosure.

1. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), “Omaha Public Power District’s Overall Integrated Plan in Response to March 12, 2012, Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events (Order Number EA-12-049),” dated February 28, 2013 (ML13064A298), (LIC-13-0019)

2. NRC Order Number EA-12-049, “Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” dated March 12, 2012 (ML12054A736), (NRC-12-0020)

3. Letter from NRC (J. S. Bowen) to L. P. Cortopassi (OPPD), “Fort Calhoun Station, Unit 1 - Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC NO. MF0969),” dated February 27, 2014 (ML14007A693) (NRC-14-0014)

4. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), “Response to Request for Information Regarding Flooding Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident- Fort Calhoun Station Flood Hazard Reevaluation Report,” dated February 4, 2015 (LIC-15-0015)

5. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), “Implementation Schedule for Phase 2 Staffing Assessment in Response to Recommendation 9.3, Emergency Planning of the Near-Term Task Force (NTTF) Review of Insights from the Fukushima Dai-ichi Accident,” dated April 25, 2014 (LIC-14-0060)

6. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), "Omaha Public Power District's First Six-Month Status Report for the Implementation of Order EA-12-049, Order

Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events," dated August 28, 2013 (ML 13268A075) (LIC-13-0123)

7. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), “Omaha Public Power District’s Second Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events,” dated February 24, 2014 (ML14055A412) (LIC-14-0021)

Attachments:
1. FLEX Overall Integrated Implementation Plan Milestone Schedule, Revision 6
2. Status of Interim Staff Evaluation Open Item / Confirmatory Items
3. Update to Overall Integrated Plan; Replacement Pages for LIC-13-0019
   - General Integrated Plan Elements
   - PWR Portable Equipment Phases 2 / 3 & Phase 3 Response Equipment/Commodities
   - Attachment 1A & Attachment 1B

Fort Calhoun Station EA-12-049 (FLEX) Overall Integrated Implementation Plan

Milestone Schedule
Revision 6

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 subsequent 6-month status reports.

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Submit 60-Day Status Report	Oct. 2012	Complete	
Submit Overall Integrated Plan	Feb. 2013	Complete	
Submit 6-Month Updates:			
Update 1	Aug. 2013	Complete	
Update 2	Feb. 2014	Complete	
Update 3	Aug. 2014	Complete	
Update 4	Feb. 2015	Complete	
Update 5	Aug. 2015	Complete	
Update 6	Feb. 2016	Complete	
Update 7	Aug. 2016	Not Started	
FLEX Strategy Evaluation	Apr. 2015	Complete	
Walk-throughs or Demonstrations	Nov. 2016	Not Started	
Perform Staffing Analysis	Mar. 2016	Not Started	May 2016
Modifications:			
Modifications Evaluation	Apr. 2015	Complete	
Design Engineering	Jan. 2016	Started	Mar. 2016
Implementation Outage	Oct. 2016	Not Started	
Storage:			
Storage Design Engineering	Oct. 2015	Complete	
Storage Implementation	Apr. 2016	Started	Sep. 2016
FLEX Equipment:			
Procure On-Site Equipment	Mar. 2016	Started	Jul. 2016
Develop Strategies with RRC	Nov. 2015	Complete	
Install Off-Site Delivery Station (if Necessary)	Not planned at this time	Not planned at this time	
Procedures:			
PWROG issues NSSS-specific guidelines	Jun. 2014	Complete	
Create Site-Specific FSGs	Dec. 2015	Complete	
Create Maintenance Procedures	Jun. 2016	Complete	
Training:			
Develop Training Plan	Apr. 2015	Complete	
Training Complete	Sep. 2016	Started	
Full Site FLEX Implementation	Oct. 2016	Started	Nov. 2016
Submit Completion Report	Dec. 2016	Not Started	

Status of Interim Staff Evaluation Open Item / Confirmatory Items

OPEN ITEMS

Item #	NRC Ref. #	Description	Status February 2016 Update
1	3.2.1.6.B	Sequence of Events (SOE) - Confirm whether the CENTS code ELAP reanalysis reflecting the CBO isolation modification affected the SOE timeline, and if so, that the SOE timeline has been updated and the overall FLEX mitigation strategies reflect these results.	COMPLETE Plant specific Nuclear Steam Supply System (NSSS) and Containment ELAP evaluations (Ref. 2 and Ref. 1, respectively), have been performed, reflecting the CBO isolation modification (Ref. 13). The results support the predictions on the SOE timeline stated in the OIP. The evaluations also provide documentation to support several ISE confirmatory items. The SOE has been updated to support the FCS FLEX mitigation strategy timing, and has been transmitted to the NRC in Attachment 3 of LIC-16-0010.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

CONFIRMATORY ITEMS

Item #	NRC Ref. #	Description	Status February 2016 Update
1	3.1.1.1.A	Protection of FLEX equipment (seismic hazard) - Confirm that all FLEX equipment stored in the auxiliary building and the new FLEX Support Building (FSB) are seismically restrained to ensure equipment is not damaged during a seismic event and that the FLEX equipment is not damaged by non-seismically robust equipment due to seismic interactions.	IN PROGRESS FLEX Storage Building design complete (Ref. 16). Expect completion of building and placement of FLEX equipment by September 2016.
2	3.1.1.2.A	Deployment of FLEX equipment (seismic hazard) - Confirm that deployment pathways for the FLEX portable equipment are not susceptible to soil liquefaction.	IN PROGRESS Contract has been issued to perform liquefaction study. Expect results by August 2016 update.
3	3.1.1.3.A	Procedural Interfaces (seismic) - Confirm the licensee develops (1) methods and locations for alternate monitoring of key parameters; (2) guidance on critical actions to perform until alternate indications can be obtained; and (3) guidance on control of critical equipment without control power.	IN PROGRESS A facility modification has been developed to support alternate monitoring locations for critical parameters (Ref. 12. Drafts of the associated guidance documentation are also complete (Ref. 19). The only critical components that must be operated without control power are the Atmospheric Dump Valves (ADVs). Guidance document for manual operation of the ADVs has been drafted (Ref. 20).The remote instrument monitoring and ADV modifications will be installed during the 2016 refueling outage and associated guidance documents will be validated as part of the modification installation process.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
4	3.1.1.4.A	Off-site Resources - Confirm the location of the off-site staging area(s) and acceptability of the access routes considering the seismic, flooding, high wind, snow, ice and extreme cold hazard.	Complete "SAFER Response Plan" (Ref. 22) issued on Sep. 30, 2015.
5	3.1.2.2.A	Deployment (flood) - Confirm the method of accessing the ultimate heat sink (UHS), the Missouri River, using FLEX equipment during high river levels or after flood waters inundate the site up to the current design basis flood elevation of 1014 foot elevation is addressed. The plan does not identify the deployed location of the fire truck or river drafting pump nor how they are accessed and monitored by plant operators, considering the site's flooded condition.	IN PROGRESS Previously, OPPD had specified that a well would be relied upon to provide makeup water in all flood scenarios, both within and beyond-design basis. OPPD is now considering the option of using a well only for BDB flooding scenarios. If that option is exercised a strategy will be developed to pre-stage pumping equipment within the plant, either behind flood barriers or at a high enough elevation to protect them from flood waters (adequate time exists in design basis flooding scenarios to pre-stage equipment). Submersible pumps may also be used. Final determination of the makeup water pumping configuration will be provided in the August 2016 update.
6	3.1.3.1.A	Protection of FLEX Equipment (high wind hazard) - Confirm the design code used for the FSB for the high wind hazard and the method of protection of the N+1 FLEX equipment from tornado borne missiles is acceptable.	COMPLETE FLEX Storage Building design (Ref. 16) protects against FCS design basis (RG 1.76 R1) wind hazard and tornado borne missiles in accordance with NEI 12-06 requirements.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
7	3.2.1.1.A	CENTS - Confirm that the use of CENTS in the ELAP analysis for FCS is limited to the flow conditions before reflux boiling initiates. This includes providing a justification for how the initiation of reflux boiling is defined. Confirm that the reanalysis for the case with the CBO isolated conforms to the above limitations.	COMPLETE The plant specific ELAP analysis (Ref. 2) was performed assuming CBO is isolated early in the event, such that leakage from the RCP seals remains less than 1 gpm per seal from the time CBO is isolated through the remainder of the event. All cases analyzed for FCS, including the maximum RCS leakage case, were analyzed for three days or more. In none of the cases did the SGs show any voiding (steam formation) at the top of the tubes. Thus, the flow quality at the top of the tubes was zero. Therefore, these cases show that single phase natural circulation flow is maintained for at least three days. Since RCS makeup is expected to be available within 24 hours, there is no expectation that FCS will leave the single phase NC flow regime during an ELAP event. A more detailed discussion of the plant specific modeling of RCS flow conditions and core uncovery times will be provided in the response to the associated FLEX audit questions provided in the SE Tracker spreadsheet.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
8	3.2.1.2.B	RCP Seal Leakage Rates - Confirm the selection and justification for the seal leakage rates assumed in the ELAP analysis from the initiation of the ELAP event to the time frame when subcooling in the RCS cold legs decreases to less than 50 degrees F. Confirm the calculated maximum temperature and pressure, and minimum subcooling in the RCS cold legs during the ELAP before isolation of the CBO. Confirm the seal leakage rates per RCP before and after isolation of the CBO used in the ELAP reanalysis for determination of the SOE and associated time limes.	COMPLETE FCS is installing a modification to ensure CBO can be isolated and remain isolated indefinitely following an ELAP (Ref. 13). A change to the "Standard Post-Trip Actions" procedure has been drafted (Ref. 17) to ensure CBO is isolated quickly on a loss of seal cooling. Per the Flowserve N-Seal white paper (Ref. 23, which references WCAP-16175, Ref. 24), this ensures that the vapor seal will remain subcooled and seal leakage will remain less than 1 GPM per seal. Because RCP CBO is isolated before RCS subcooling falling below 50 degrees F, calculation of maximum temperature and pressure, and minimum subcooling is not necessary. The plant-specific NSSS analysis (Ref. 2) provides a detailed discussion of how RCP seal leakage is treated before and after isolation of CBO.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
9	3.2.1.3.A	Decay Heat - Confirm the key physics parameters used for each of the decay heat evaluation scenarios to ensure that the FCS ELAP response is conservative relative to the ANS standard.	COMPLETE The plant-specific ELAP analysis (Ref. 2) performed for FCS implemented the ANS 5.1-1979 decay heat curve with two sigma uncertainty and included the effects of neutron capture and long term actinides developed in Westinghouse Document 25/26/27-AS95-C-015, Rev. 3, "PVNGS Decay Heat Curve Including Long Term Actinides". This document states that the decay heat curve is applicable up to the following limits: 1. Power level up to 4070 MWt 2. Fuel enrichments up to and including 5.0 weight percent 3. Fuel burnups up to 73,000 MWD/MTU 4. Up to a 24 month operating cycle with a 90% overall capacity factor 5. Not applicable to hybrid fuel 6. Fuel characteristics are based on the entire fuel cycle The initial core power level for the FCS analysis is 100% or 1500 MWt. Fuel enrichment at FCS is less than 5.0 weight percent per federal law and there is no hybrid fuel in the FCS core. The operating cycle is 18 months and fuel burnup does not surpass 73,000 MWD/MTU. Thus, the curve used in the FCS analyses is applicable and conservative.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
10	3.2.1.4.A	Initial Values for Key Plant Parameters and Assumptions - Confirm which inputs and assumptions are appropriate relative to being plant specific or derived from WCAP-17601-P.	COMPLETE Documentation of the validity of the design inputs and assumptions is provided in the NSSS timing analysis performed to address Open Item #1 (Ref. 2).
11	3.2.1.5.A	Monitoring Instrumentation and Controls - Confirm suitability of emergency feedwater storage tank (EFWST) level monitoring instrumentation considering the environmental conditions in the auxiliary building following an ELAP event.	COMPLETE An evaluation of the environmental conditions in the auxiliary building following an ELAP has been performed (Ref. 3). The environment in the area of the EFWST level transmitters and local indications is essentially the same as in other SBO scenarios and does not preclude operator entry to monitor level locally, if necessary. The method of monitoring EFWST level locally has been addressed in the draft guideline for remote parameter monitoring (Ref. 19).

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
12	3.2.1.5.B	Monitoring Instrumentation and Controls - Confirm suitability of existing or replacement safety injection tank (SIT) level instrumentation considering the environmental conditions in the containment following an ELAP event.	COMPLETE Environmental conditions inside containment following an ELAP event have been established as part of the NSSS analyses conducted to address Open Item #1 (Refs. 1 and 2). The evaluation shows that the current instrumentation will continue to operate in the predicted environment (ELAP containment response does not exceed design conditions for over 30 days). Further, the NSSS analysis shows that SIT level indication is not necessary to determine when closure of the SIT isolation valves is necessary.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
13	3.2.1.8.A	Core Sub-Criticality - Confirm that the reanalysis discussed in Confirmatory Item 3.2.1.1.A continues to align with the generic resolution for boron mixing under natural circulation conditions potentially involving two-phase flow, in accordance with the Pressurized-Water Reactor Owners Group position paper, dated August 15, 2013 (ADAMS Accession No. ML 13235A135 (nonpublic for proprietary reasons)), and subject to the conditions provided in the NRC endorsement letter dated January 8, 2014 (ADAMS Accession No. ML 13276A183) following SOE and FLEX mitigation strategy impacting changes.	COMPLETE With the FCS ELAP related plant modification which allows early isolation of CBO lines (Ref. 13), RCP seal leakage is expected to be ≤ 1 gpm/RCP with an additional 1.0 gpm of unidentified leakage. With this low leak rate, the plant-specific analysis performed to address Open Item #1 (Ref. 2) has shown that FCS remains in single phase NC conditions (defined as no voiding in the SG upper tube regions and a NC flow rate consistent with single phase flow) well beyond three days into the ELAP event. RCS makeup via a charging pump powered by a FLEX portable generator is expected to be available within 24 hours of event initiation; therefore, boron mixing would occur via normal single phase NC flow through the RCS. No mixing model which considers two-phase NC flow or SG reflux cooling is required in this analysis. A more detailed discussion of the plant specific modeling of RCS flow conditions and boron addition to ensure adequate shutdown margin will be provided in the response to the associated FLEX audit questions provided in the SE Tracker spreadsheet.
14	3.2.4.1.A	Equipment Cooling (Water) - Confirm installed charging pumps can operate during an ELAP considering the loss of support equipment.	IN PROGRESS Expect completion to be documented in August 2016 update.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
15	3.2.4.2.A	Equipment Cooling (Ventilation) - Confirm that the licensee addresses environmental conditions in the vicinity of and access to all deployed FLEX equipment in the auxiliary building, to ensure continuous equipment operation and acceptable human performance.	COMPLETE A GOTHIC analysis of post-ELAP conditions in the auxiliary building (all FLEX equipment is deployed in the Auxiliary Building) has been performed (Ref. 3). The analysis shows that environmental conditions in the vicinity of and access to all deployed FLEX equipment in the auxiliary building, allows for continuous equipment operation and acceptable human performance, as long as a ventilation path via either the Fuel Handling Building truck bay roll-up door, or a new ventilation port being installed as a FLEX implementation modification (Ref. 15), has been established prior to onset of SFP boiling. Guidance has been developed for FLEX implementation to ensure the appropriate ventilation actions are accomplished within the required timeframe (Ref. 21). Validation of those actions will be performed after the ventilation port has been installed.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
16	3.2.4.2.B	Equipment Cooling (Ventilation) - Confirm that the licensee addresses environmental conditions in the main control room (CR) and the need for ventilation prior to re-establishing power to the CR ventilation fans using the FLEX DG at approximately 9 hours after the ELAP as indicated on the SOE timeline.	COMPLETE A control Room Heatup GOTHIC calculation has been completed that shows CR cooling is not required until 46 hours post-ELAP (Ref. 3). The plant modification for re-powering the 480VAC electrical buses (Ref. 7) includes the strategy for re-powering a CR air conditioning unit within that timeframe. The CR cooling units meet the robustness requirements for installed plant equipment.
17	3.2.4.2.C	Equipment Cooling (Ventilation) - Confirm the acceptability of the battery room temperatures (extreme hot or extreme cold) on battery performance.	IN PROGRESS A GOTHIC analysis of post-ELAP conditions in the auxiliary building (all FLEX equipment is deployed in the Auxiliary Building) has been performed (Ref. 3). Results show that under ELAP conditions, Switchgear and battery room temperatures do not exceed limits until well after the 480 VAC load centers are re-energized, thereby allowing restoration of battery room HVAC, if necessary. Evaluation of low temperature conditions is in progress. Expect completion to be documented in August 2016 update.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
18	3.2.4.2.D	Equipment Cooling (Ventilation) - Confirm the acceptability of the hydrogen buildup in the battery room during charging.	COMPLETE The plant modification for re-powering the 480VAC electrical buses (Ref. 3) includes the capacity to re-power a battery room exhaust fan prior to re-charging the battery.
19	3.2.4.4.A	Lighting - Confirm the lighting provisions for all areas within the auxiliary building where FLEX equipment is deployed as well as the outdoor areas where FLEX equipment is deployed.	IN PROGRESS Expect completion to be documented in August, 2016 update.
20	3.2.4.4.B	Communications - Confirm that upgrades to the site's communications systems have been completed.	IN PROGRESS Expect completion to be documented in August 2016 update.
21	3.2.4.5.A	Protected and Internal Locked Area Access - Confirm how the provisions for access to protected areas and internally locked areas are incorporated into the FLEX mitigation strategies.	COMPLETE Access to protected and internally locked areas during ELAP events has been discussed with Security. Due to the sensitive nature of this subject, the exact provisions are not described in this response, but have been appropriately incorporated into FLEX mitigation strategies. Documentation of protected and internal locked area access plans will be provided to NRC personnel when requested.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
22	3.2.4.7.A	Water Sources - Confirm that the licensee addresses the impacts of water chemistry from the various onsite sources for potential use in FLEX strategy installed and portable equipment.	COMPLETE A water chemistry evaluation (Ref. 4) was conducted to determine the viability of existing water sources to support FLEX makeup needs regarding maintenance of heat transfer and corrosion resistance. FLEX strategies use insights from this report to prioritize water sources and determine when and how to utilize National SAFER Response Center equipment.
23	3.2.4.8.A	Electrical Power Sources - Confirm the technical basis for the selection and size of the FLEX generators to be used in support of the coping strategies and the planned approach for fault protection and electrical separation between existing power sources and the FLEX power sources.	COMPLETE The plant modification for re-powering battery chargers (Ref. 6), the 480VAC electrical buses (Ref. 7) and the FLEX SIRWT Pump (Ref. 9) include evaluations of necessary loads, supporting the selection and size of the FLEX generators to be used in support of the coping strategies. The planned approach for fault protection and electrical separation between existing power sources and the FLEX power sources is also included in these modifications.
24	3.2.4.9.A	Portable Equipment Fuel - Confirm the total fuel consumption needs when FLEX equipment designs are finalized.	IN PROGRESS Expect completion to be documented in August 2016 update.

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Item #	NRC Ref. #	Description	Status February 2016 Update
25	3.2.4.10.A	Load Reduction to Conserve DC Power - Confirm if the non-1E battery modification becomes a plan revision to extend the battery life of the existing Class 1 E batteries and that any changes to the FLEX mitigation strategies have been incorporated.	CLOSED OPPD has evaluated the ELAP capabilities of current class 1E DC batteries, along with other applications requiring portable generators to support FLEX strategies and has concluded that restoration of power to a battery charger prior to depletion of the current batteries provides more benefits than adding a non-1E battery to increase the depletion time on the 1E batteries. EC 60812 (Ref. 6) assures that the FLEX strategy of using Diesel Generators connected by portable and installed cabling can be accomplished prior to battery depletion using the current design basis load shed. Therefore, this modification has been cancelled.
26	3.3.1.A	Use of Portable Pumps - Confirm that the number of FLEX pumping equipment for accessing the UHS during the Phase 2 coping strategies meets the spare (N+1) capability. One fire truck and two river drafting pumps are provided to access the UHS. Confirm whether the river drafting pumps alone can achieve the mitigation strategy objectives (without the use of the fire truck) during both the flooded and non-flooded site conditions. Alternately, confirm implementation of a qualified well as a diverse alternate source of a long term water supply.	IN PROGRESS Previously, OPPD had specified that a well would be available as a diverse means of supplying makeup water in all scenarios, including beyond-design basis. OPPD is now considering the option of using a well only for BDB flooding scenarios. If the option is exercised, additional pumping units will be added as necessary to assure N+1 is achieved for pumping of makeup water from the UHS. Final determination of the makeup water-pumping configuration will be provided in the August 2016 update.

Status of Interim Staff Evaluation Open Item / Confirmatory Items

Item #	NRC Ref. #	Description	Status February 2016 Update
27	3.4.A	Off-Site Resources - Confirm how conformance with NEI 12-06, Section 12.2 guidelines 2 through 10 will be met.	COMPLETE The FCS SAFER Response Plan (Ref. 22) was issued on Sep. 30, 2015.

ATTACHMENT 2 REFERENCES:

1. FC08551, R0, Ft. Calhoun Containment ELAP Analysis DAR-SCC-15-001
2. FC08552, R0, Fort Calhoun Station NSSS Response Evaluation for an ELAP Event Initiating from Mode 1 DAR-SCC-15-002
3. FC08463, R0, Auxiliary Building Temperature Response Subsequent to Extended Loss of AC Power (ELAP)
4. SL-011688, R2, Evaluation of Alternate Coolant Sources for Use in Mitigating a Beyond Basis External Event
5. FC08424, R0, Spent Fuel Pool Time to Boil and Boiloff Rate Curves
6. EC 60812, R0, 2015 RFO Electrical Connections – FLEX
7. EC 60820, R0, 2016 Online Electrical Connections – FLEX
8. EC 65759, DRAFT, FLEX DG Electrical Supply Cable Routing
9. EC 60814, R0, Installation of New FLEX Safety Injection Refueling Water Tank Pump
10. EC 60816, R0, FLEX Valve Station and Distribution Connections
11. EC 60821, R0, Emergency RCS Fill Connections – FLEX
12. EC 64116, R0, Remote Instrument Monitoring Points - Fukushima
13. EC 60815, R0, HCV-208 Valve, Actuator and Accumulator Replacement – Fukushima
14. EC 43218, R0, MS Atmospheric Dump Valve for FLEX
15. EC 61834, R0, Installation of New Fuel Handling Building Roof Vent
16. EC 67360, FLEX Storage Building (This is a DCP - documentation only – EC. See PFES report MR-212921-01, R1, Fort Calhoun FLEX Methodology Report for FLEX Storage Building Design Description)
17. EC 67207; EOP-00, FLEX Markup, Standard Post Trip Actions
18. EC 67207; EOP-07, FLEX Markup, Station Blackout
19. EC 67207; FSG-07, DRAFT, Loss of Vital Instrument or Control Power
20. EC 67207; FIG-HR-01, DRAFT, Operation of Atmospheric Dump Valves PCV-1001 and 1002 During BDB Event

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21. EC 67207; FIG-SFP-02, Venting the Fuel Handling Building
22. 38-9247617-000, R0, SAFER Response Plan for Fort Calhoun Nuclear Power Station
23. ML 15310A09, Flowserve White Paper on the Response of the N-Seal Reactor Coolant Pump (RCP) Seal Package to Extended Loss of AC Power.
24. WCAP-16175-P-A, R0, Model for Failure of RCP Seals Given Loss of Seal Cooling in CE NSSS Plants

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Enclosure, Attachment 3

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Replacement Pages for
General Integrated Plan Elements
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the plant can be brought to a Mode 4 or 5 condition. Mitigation strategies for flooded condition are not required for initiation from modes other than 4 and 5. Mitigation strategies for Modes 4 and 5 are developed for both flooded and non-flooded conditions, and are described in Appendix B, Actions 23 and 24.

References:

1. NEI 12-06, Rev. 0, Diverse and Flexible Coping Strategies (Flex) Implementation Guide, August 2012
2. NEI 12-01, Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities, Revision 0, May 2012
3. OG-12-434, PWROG Core Cooling Position Paper

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 NEI 12-06 13.1**	*Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action.*

FCS expects full compliance with the guidance, with no deviations.

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 walk-through 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 Deviation Table (Attachment 1B).*

General :

1. A site specific NSSS evaluation has been performed for FCS [Refs. 1 and 2]. The analysis was performed using computer code CENTS. The analysis methodology is consistent with WCAP-17601-P [Ref. 3]; Attachment 1B provides a summary of key parameters of interest.

2. Containment integrity was reviewed by use of computer code CONTRANS version ctn2m1.0702. [See Ref. 4.]

The sequence of events described in this section provides an overview of the time constraints and actions taken in response to an Extended Loss of AC Power (ELAP) and/or Loss of Ultimate Heat Sink (LUHS) at FCS. The sequence described below is a general description of

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plant response and actions by station personnel. It is not intended to define exact completion times.

- A timeline is provided in Attachment 1A.
- The technical bases for the time constraints and strategies listed in this section and Attachment 1A are provided in Appendix B.
- The timeline provided in Attachment 1A also relates the actions described in this section to the FLEX implementation strategies described in Appendix B and supporting station modifications described in Appendix C that are needed to mitigate the effects of an ELAP/LUHS event.

Deployment strategies for actions to be completed in less than 8 hours have been deemed feasible within the identified time constraints based on preliminary walkdowns conducted by Engineering and Operations personnel. Formal timeline walkthroughs will be completed during the FLEX equipment design and procurement process.

T=0: Initiation of Station Blackout (SBO).

T+1 min: Reactor/Turbine Trip, Turbine Driven Auxiliary Feedwater (TDAFW) pump automatic start on low steam generator (SG) level. SG heat removal via main steam safety valves (SBO credited method), or manual operation of atmospheric dump valve (ADV) or air assisted main steam safety valves. RCS cooling by natural circulation. RCS inventory maintained by isolation of letdown (occurs automatically on high letdown temperature due to loss of Charging/CCW if not manually isolated). 125 VDC/120VAC buses powered from station batteries. Operators enter emergency operating procedures (EOPs), transitioning from Reactor Trip response procedure to SBO procedure. Key actions within procedures include:

- Verification of system response to ensure safety functions is satisfied.
- Attempting alternate methods of starting/loading station Emergency Diesel Generators (EDG)

T+10 min: Isolation of RCP Controlled Bleed-off (CBO) to minimize seal leakage. See discussion of this strategy in Appendix B, Action 2.

T+15 min: Initial shedding of non-vital loads to extend battery life (this is an existing SBO action which will assure at least 8 hours of Station Battery availability).

T+1 hr: Initial actions taken under EOP direction complete (some DC bus load shed actions continue until T+2 hr). Operations personnel survey plant for damage and evaluate likelihood of EDG recovery within 4 hours (FCS design SBO coping period). See discussion of this strategy in Appendix B, Action 3.

T+2 hr: Assessment of EDG status indicates recovery not likely within 4 hours. ELAP declared. Operators implement FLEX Support Guidelines. Initiate rapid cooldown using Atmospheric Dump Valves. See discussion of this strategy in Appendix B, Action 5. Begin FLEX equipment deployment. See discussion of this strategy in Appendix B, Action 6.

T+4 hr: Transition from Phase 1 to Phase 2 for Core cooling function by beginning makeup to Emergency Feedwater Storage Tank (EFWST) from Safety Injection Refueling Water Tank (SIRWT). See discussion of this strategy in Appendix B, Actions 8 & 9. If EFWST makeup from the SIRWT is not available, the Ultimate Heat Sink (UHS – Missouri River) or other water source, if available will be used. See discussion of this

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strategy in Appendix B, Actions 7&10. EFWST makeup is required within 4.3 hours of Auxiliary Feedwater (AFW) initiation during rapid cooldown. EFWST makeup is required within 8 hours of AFW initiation if Hot Shutdown (Mode 3) condition is maintained. See discussion of this strategy in Appendix B, Action 5.

T+7 hr: Establish power to at least one 125VDC bus and Control Room lighting using a FLEX diesel generator. Power must be established within 8 hours to prevent battery depletion using current load shed strategy. If it is determined during the design of the FLEX generator interface that power cannot be reliably restored to at least one DC bus within 8 hours, contingency plans have been developed to either provide additional load shed actions or implement a modification to move certain non-1E loads from the station batteries to a new dedicated non-vital battery. See discussion of this strategy in Appendix B, Actions 11 & 12.

T+12 hr: Establish Spent Fuel Pool (SFP) cooling by starting SFP makeup and establishing vent path from Fuel Handling Building. Boiling in the SFP will start in approximately 16 hours. Boil off from SFP will result in SFP level reduction to 8 ft. above active fuel in approximately 100 hours. Makeup flow rate will be established to maintain SFP level between normal water level and 8 ft. above active fuel. See discussion of this strategy in Appendix B, Actions 15, 16 & 17.

T+24 hr: Establish makeup to RCS using Charging pumps or FLEX SIRWT Pump or backup FLEX pumps taking suction from SIRWT (Boric Acid Storage Tanks may be used if available). This action is performed to ensure 1% Shutdown Margin (SDM) is maintained. Calculations [Ref. 2] indicate that 1% SDM will occur approximately 40 hours after event initiation. Core uncovery will not occur until approximately 7 days after event initiation. See discussion of this strategy in Appendix B, Actions 19 & 20.

T+40 hr: Establish control room ventilation by re-powering a control room exhaust fan via a portable FLEX diesel generator or using temporary cooling units powered from a portable generator. A control room heatup calculation using the heat inputs and environmental conditions expected during an ELAP caused by a BDBEE has been conducted [Ref. 4], which indicates this action must be completed within 46 hours. See discussion of this strategy in Appendix B, Actions 13 & 14.

T+48 hr: Establish makeup to SIRWT from an alternate source of water (UHS - Missouri River, water from a FLEX well). Based on makeup needs to the Steam Generators and SFP and using conservative assumptions for available water from the SIRWT, the SIRWT will be depleted in approximately 52 hours. See discussion of this strategy in Appendix B, Action 18.

T+72hr: Additional resources from Regional Response Center arrive to establish long term methods of:

- Makeup water treatment
- Spent Fuel Pool cooling
- RCS cooling
- Boric Acid mixing
- Restoration of installed plant equipment

T+72 hr: Isolate Safety Injection Tanks (timing variable, based on containment temperature). Establish Containment Cooling using equipment supplied from Regional Response Center – 4160 VAC portable diesel generator and high volume water pump to supply containment cooling units and/or Containment Spray. Calculations [Ref. 1] indicate

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that containment cooling will not be required for at least 30 days following an ELAP/LUHS. However, a strategy has been developed to utilize National Safer Response Center (NSRC) equipment to establish containment cooling in the event that RCS leakage is worse than predicted. See the "Maintain Containment – Phase 3" section of this plan and Appendix B, Action 25 for further details on this strategy.

References:

1. FC08551, Rev. 0, Fort Calhoun Containment ELAP Analysis DAR-SCC-15-001
2. FC08552, Rev. 0, Fort Calhoun Station NSSS Response Evaluation for an ELAP Event Initiating from Mode 1 DAR SCC-15-002
3. WCAP-17601-P, Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs, Rev. 0, dated August 2012
4. FC08463, Rev. 0, Auxiliary Building Temperature Response Subsequent to Extended Loss of AC Power (ELAP)

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.*

FCS has defined the storage and deployment locations of FLEX equipment. Preliminary deployment paths have been identified and are illustrated in Attachment 3. The final deployment paths and storage locations will be identified during the FLEX equipment design process.

To ensure deployment can be achieved within the time constraints for strategies that must be in place within 24 hours, FLEX equipment necessary to accomplish those strategies will be stored in a robust structure (auxiliary building) within the plant power block. Equipment stored within the power block is depicted on the deployment path drawings in Attachment 3.

FCS will develop procedures and administrative guidance to keep the deployment paths open, or define actions to make them open during all modes.

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PWR Portable Equipment Phases 2 / 3 &
Phase 3 Response Equipment/Commodities
(LIC-13-0019, Enclosure)

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PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	Maintenance
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility	(Pump Criteria = Max Flow, Shutoff Head)	*Maintenance / PM requirements*
FLEX SIRWT Pump (FSP)	**X**		**X**	**X**	**X**	[225 gpm, 520 ft.], Submersible	*Will follow EPRI template requirements*
FSP Dedicated DG	**X**		**X**	**X**	**X**	480 VAC [128 kW]	*Will follow EPRI template requirements*
FLEX Valve Station (FVS)	**X**		**X**	**X**	**X**	Throttle 300 gpm to 0 gpm	*Will follow EPRI template requirements*
FLEX SIRWT Backup Submersible Pump	**X**		**X**	**X**	**X**	[500 gpm, 200 ft.], Submersible	*Will follow EPRI template requirements*
Diesel SIRWT Backup Pump (2)	**X**		**X**	**X**	**X**	[500 gpm, 100 psia]	*Will follow EPRI template requirements*
FLEX 400 kW DG (2)	**X**		**X**	**X**	**X**	480 VAC [400 kW]	*Will follow EPRI template requirements*
480 V Portable SWGR	**X**		**X**	**X**	**X**	[480 VAC]	*Will follow EPRI template requirements*
Well Pump	**X**		**X**	**X**	**X**	[300 gpm, 50 psia (nominal)]	*Will follow EPRI template requirements*
River Drafting Pump	**X**		**X**	**X**	**X**	[675 gpm, 50 psia]	*Will follow EPRI template requirements*
Diesel Pump in a Fire Truck	**X**		**X**	**X**	**X**	[>300 gpm, 575 ft.]	*Will follow EPRI template requirements*
FLEX 30 kW DG to Power Battery Charger				**X**		480 VAC [30 kW]	*Will follow EPRI template requirements*

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PWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
480 VAC (Low Voltage) Generator	**X**		**X**	**X**	**X**	1 MW	Defense-in-depth. Backup to Phase 2 FLEX Generators
4160 VAC (Medium Voltage) Generator	**X**	**X**	**X**	**X**	**X**	1 MW	Portable 4160 VAC generator will power one installed vital bus. Not Required for Coping. See Appendix B, Action 25 for further details.
Medium Flow, Low Press. Pump	**X**	**X**	**X**			2500 gpm, 300 psi	Self-powered (or provided with necessary generator power). Not Required for Coping. See Appendix B, Action 25 for further details.
SG/RPV Makeup Pump	**X**					500 gpm, 500 psi	Self-powered (or provided with necessary generator power). Not Required for Coping. See Appendix B, Action 25 for further details.

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PWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Low Flow, High Pressure Injection Pump	**X**					60 gpm, 2,000 psi	Self-powered (or provided with necessary generator power). Not Required for Coping. See Appendix B, Action 25 for further details.
High Flow, Low Press. (Dewatering) Pump	**X**	**X**				5000 gpm, 150 psi	Self-powered (or provided with necessary generator power). Not Required for Coping. See Appendix B, Action 25 for further details.
Portable Submersible Pump					**X**	1400 gpm, 75 psi	Self-powered (or provided with necessary generator power). Not Required for Coping. Used to maintain installed plant equipment operability for flood scenarios slightly greater than Design Basis.

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Phase 3 Response Equipment/Commodities	
Item	**Notes**
Commodities • Food/Water • Diesel Fuel • Air Compressor • Portable Lighting	Commodities will not be required for at least 72 hours. See Appendix B, Action 25 for further details.
Fuel Requirements • Bulk #2 Diesel Fuel • Portable fuel transfer pumps • Fuel Bladders	Fuel will not be required for at least 72 hours. See Appendix B, Action 25 for further details.
Liquid Processing Equipment • Water Purification System • Boric Acid Mixing System	See Appendix B, Action 25 for further details.
Heavy Equipment • Transportation equipment	Backup to on-site equipment. See Appendix B, Action 25 for further details
Site Recovery Equipment	See Appendix B, Action 25 for further details.

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Attachment 1A / Attachment 1B
(LIC-13-0019, Enclosure)

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Attachment 1A
Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N[6]	Remarks / Applicability
	0	Event Starts	N	Plant @100% power
1	1 Min.	Rx/Turbine Trip, AFW Initiation	N	Operators enter EOPs, perform Standard Post-Trip Actions, and ensure Safety Function support equipment operating as designed for SBO. See Appendix B, Action 1.
2	10 Min.	Isolate RCP Controlled Bleedoff	Y	See Appendix B, Action 2. Although WCAP-16175 (Ref. 2 of App. B, Action2) suggests isolation of CBO within 10 minutes is most desirable, the action will still be effective if done ASAP.
3	30 Min.	Begin DC Bus Load Shed. Actions occur between T+15 min. and T+2 hr.	Y	EOP/AOP Attachment 6. Existing SBO strategy. See Appendix B, Action 1.
4	1 hr.	Survey plant for damage, determine status of DGs	N	See Appendix B, Action 4
5	2 hr.	DC Bus Load Shed complete	Y	This action is delineated in existing SBO EOP.
6	2 hr.	Commence Rapid Cooldown using Atmospheric Dump Valves	N	This action provides several advantages in mitigating an ELAP event, but is not required to be performed within a specific time constraint. See Appendix B, Action 5.

[6]Instructions: Provide justification if No or NA is selected in the remark column
If yes include technical basis discussion as requires by NEI 12-06 section 3.2.1.7

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7	4 hr.	Transition from Phase 1 to Phase 2 for Core cooling function by Beginning Make up to EFWST.	Y	Initiation time provides margin before EFWST depletion at 4.3 hrs. during rapid cooldown. See Appendix B, Actions 7 – 10. Note that FC08552 (Ref. 2 in the Sequence of Events discussion) states that a minimum of 8.8 hours of heat removal capacity exists in the S/G, even when the EFWST has been depleted.
8	7 hr.	Supply at least one 1E 125VDC bus and CR Lighting from portable diesel generator	Y	Initiation time provides margin before battery depletion at 8 hrs. See Appendix B, Actions 11 & 12.
9	12 hr.	Establish SFP Makeup using FLEX SIRWT Pump or backup FLEX pumps taking suction from SIRWT. Establish FHB vent path by opening Truck Bay roll-up door, or removing emergency vent port cover on roof of FHB.	Y	Alignment of SFP makeup provides margin before the onset of SFP boiling at 16 hours. Time constraint on this action is considered 100 hours; this is the time available until SFP level reaches 8ft. above the top of the fuel racks. See Appendix B, Actions 15-17.
10	24 hr.	Make up to RCS using Charging pump or FLEX SIRWT taking suction from SIRWT.	Y	Alignment of RCS makeup at 24 hours is performed to ensure 1% SDM is maintained. Minimum time to 1% SDM is ~ 40 hours. 24 hours provides margin to account for uncertainties in core loading between fuel cycles. With low RCS leakage due to early RCP CBO termination, core uncovery is not expected for at least 7 days. See Appendix B, Actions 19 and 20.
11	40 hr.	Establish CR ventilation using FLEX portable diesel Generator through station switchgear.	Y	Initiation time provides margin before CR habitability is challenged at 46 hrs. See Appendix B, Actions 13 & 14.

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12	48 hr.	Establish makeup to SIRWT from alternate water source (UHS or dedicated well).	Y	Alignment of SIRWT makeup needed before depletion at 48 hours. See Appendix B, Action 18.
13	72 hr.	Isolate SI Tanks.	Y	SI tanks will not inject Nitrogen initially, as long as SG pressure is maintained > 100 psia (see discussion of SG pressure band in Attachment 1B). As containment temperature rises, SIT gas pressure will also rise. Worst case, per FC08552 (Ref. 2 from Sequence of Events discussion), it will take 3 days for containment temperature to reach the point where the liquid contents of the SITs would be depleted.
14	>72 hr.	Establish Containment Cooling or Spray using equipment provided by Regional Response Centers.	N	This is a defense-in-depth action. Analysis shows that containment cooling is not required for > 30 days following an ELAP. See "Maintain Containment – Phase 3" section of this plan.

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Attachment 1B

NSSS Significant Reference Analysis Deviation Table[7]

Item	Parameter of interest	WCAP value (WCAP-17601-P August 2012 Revision 0)	WCAP page	Plant applied value	Gap and discussion
1	Decay heat model	ANS 5.1-1979 + 2 sigma or equivalent	4-13	same	NA
2	Applicable computer code for NSSS analysis	CENTS	4-8	same	NA
3	RCS leakage (non-RCP)	Maximum of 1 gpm unidentified leakage at normal operating pressure	4-14	same	NA
4	RCP leakage	15 gpm per RCP	4-36	1 gpm per RCP	RCP Controlled Bleedoff (CBO) isolated early in event. Seal leakage expected to be <1 gpm (See WCAP-16175-P-A per NRC Endorsement of Flowserve white paper, ML15310A09)
5	Number of SGs used to establish natural circulation and perform plant cooldown	Two	4-13	same	NA
6	Total TDAFWP flow capability	12.4 lbm/sec/SG	4-29	17.88 – 13.75 lbm/sec/SG (based on TDAFWP Inlet pressure)	FC08552 (Ref. 2 from Sequence of Events discussion) established pump characteristics for TDAFWP, based on vendor data and SG pressure response to RCS cooldown.

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NSSS Significant Reference Analysis Deviation Table[7]

Item	Parameter of interest	WCAP value (WCAP-17601-P August 2012 Revision 0)	WCAP page	Plant applied value	Gap and discussion
7	Initial RCS Temperature	Full power conditions	4-13	same	NA
8	Initial RCS Pressure	Full power conditions	4-13	same	NA
9	Time initiating cool down	2 hours	4-14	same	NA
10	Rate of RCS cool down	75°F / hr	4-14	same	NA
11	Target cooldown temperature	Steam generator pressure = 120 psia	4-16	Steam generator pressure controlled at 100 - 120 psia	FC08552 evaluated reactivity and TDAFWP supply concerns and determined that a SG pressure control band could be used to optimize operational flexibility.

Fort Calhoun Station EA-12-049 (FLEX) Overall Integrated Implementation Plan

NSSS Significant Reference Analysis Deviation Table[7]

Item	Parameter of interest	WCAP value (WCAP-17601-P August 2012 Revision 0)	WCAP page	Plant applied value	Gap and discussion
12	RCS Heat Loss Model	Plant-specific values provided in WCAP-17601-P	4-28	Plant-specific values provided in FC08552	Methodology used for FC08552 is similar to WCAP-17601 and values are similar. However, FC08552 utilizes design basis values provided in a separate design input from that used in WCAP-17601, and the change in containment temperature is modeled to support containment response evaluation (FC08551, Ref. 1 from Sequence of Events discussion), which results in slightly different heat loss values.
13	RCS Geometry (volume and elevations including initial pressurizer level)	Modeled in CENTS	4-8	same	NA

Fort Calhoun Station EA-12-049 (FLEX) Overall Integrated Implementation Plan

NSSS Significant Reference Analysis Deviation Table[7]

Item	Parameter of interest	WCAP value (WCAP-17601-P August 2012 Revision 0)	WCAP page	Plant applied value	Gap and discussion
14	SIT/ACC Liquid Volume	900.6 ft^3 (for minimum SIT injection parameters) 815.4 ft^3 (for maximum SIT injection parameters)	4-18	902.6 ft^3 (for minimum SIT injection) 802.1 ft^3 (for maximum SIT injection).	FC08552 uses TS limiting values, which are slightly more conservative than WCAP-17601.
15	SIT/ACC Total Volume	1306 ft^3	4-18	1300 ft^3	FC08552 uses TS stated value, which is slightly more conservative than WCAP-17601.
16	SIT/ACC Gas Pressure	255 psia (for minimum SIT injection parameters) 400.7 psia (for maximum SIT injection parameters)	4-18	255 psia (for minimum SIT injection) 336.4 psia at event onset (for maximum SIT injection).	FC08552 uses TS limiting values. Low pressure is the same as WCAP; high pressure is lower than WCAP, which uses a conservatively assumed value when containment temp. reaches 300°F. FC08552 calculates SIT pressure over time based on containment temperature established in FC-08551.

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NSSS Significant Reference Analysis Deviation Table[7]

Item	Parameter of interest	WCAP value (WCAP-17601-P August 2012 Revision 0)	WCAP page	Plant applied value	Gap and discussion
17	Sub-criticality requirements	Keff < 0.99	4-32	same	NA
18	SIT/ACC Boron Concentration	2160 ppm	4-18	1900 ppm	FC08552 uses TS stated value, which is more conservative than WCAP-17601.
19	BAST Boron Concentration	Not credited in WCAP-17601 for C-E plants	NA	NA	NA
20	RWST Boron Concentration	Not credited in WCAP-17601 for C-E plants	NA	1900 ppm	FC08552 determines the amount of water from the SIRWT needed at TS minimum boron concentration to maintain 1% SDM throughout the event.
21	Letdown Capability via Head Vent	Not credited in WCAP-17601 for C-E plants	NA	Variable, based on RCS pressure	FC08552 demonstrates that the capacity of the RV head vents is adequate to allow needed injection of borated water to maintain 1% SDM throughout the event.

[7] OPPD has performed various FCS plant specific evaluations to establish applicable time constraints and FLEX equipment capabilities. The input parameters specified in WCAP-17601-P were used as the basis for these evaluations.