



10 CFR 50.4  
10 CFR 50.54(f)

LIC-16-0048  
August 12, 2016

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

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

Subject: Request for Relaxation of March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events and Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-049 and EA-12-051)

References: See page 9

On March 12, 2012, the NRC issued two orders [Reference 1 and 2] to the Omaha Public Power Districts (OPPDs) Fort Calhoun Station (FCS). EA-12-049 directed FCS to develop, implement, and maintain additional guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities in the event of a beyond-design-basis external event. EA-12-051 directed FCS to install additional spent fuel pool level instrumentation.

EA-12-049, Section IV A.2, states that full implementation of the Order's requirements shall be completed no later than two (2) refueling cycles after submittal of the Overall Integrated Plan (OIP) or December 31, 2016, whichever comes first. On February 28, 2013, OPPD submitted the FCS Mitigating Strategies Overall Implementation Plan, LIC-13-0019 (Reference 3) using the guidance in Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, for simultaneous occurrence of two events: Extended Loss of AC Power (ELAP) and Loss of Normal Access to Ultimate Heat Sink (LUHS). Full compliance with Order EA-12-049 was planned for the Fall 2016 Refueling Outage (RFO28).

EA-12-051, Section IV A.2, states that full implementation of the Order's requirements shall be completed no later than two (2) refueling cycles after submittal of the OIP or December 31, 2016, whichever comes first. On February 28, 2013, OPPD submitted the FCS Mitigating Strategies Overall Implementation Plan, LIC-13-0011 (Reference 5). Full compliance with Order EA-12-051 was planned for the Fall 2016 Refueling Outage (RFO28).

On March 8, 2016, NRC issued the plan for the onsite audit related to EA-12-049 and EA-12-051 (Reference 6). One of the purposes of the audit was to provide the NRC staff the opportunity to gain key insights most easily obtained at the plant as to whether the licensee is on the correct path for compliance with the Mitigation Strategies and SFPI orders. NRC issued the audit report on July 5, 2016 (Reference 7). The audit report concluded the NRC staff completed all three parts of the onsite audit plan and continues to evaluate four open audit review items. These four items are associated with EA-12-049.

By letter dated June 24, 2016 (LIC-16-0043), Omaha Public Power District (OPPD) provided formal notification to the U.S. Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.4(b)(8) and 10 CFR 50.82(a)(1)(i) of OPPD's contingent determination to permanently cease power operations at Fort Calhoun Station (FCS) no later than December 31, 2016. FCS plans to remove all fuel from the reactor pressure vessel (RPV) to the SFP by December 31, 2016.

With permanent cessation of operations and permanent removal of fuel from the reactor vessel, the docketed plans to implement the Orders require revision to reflect this change in status. Based on discussions with the NRC related to implementing orders EA-12-049 and EA-12-051 and in view of permanent cessation of power operation; OPPD requests a relaxation of the implementation date for compliance with Orders EA-12-049 and EA-12-051 to August 31, 2017.

### **Basis for Relaxation**

Per NRC Orders EA-12-049 section IV.C and EA-12-051 section IV.C, the Director, Office of Nuclear Reactor Regulation or the Director, Office of New Reactors may, in writing, relax or rescind any of the Orders' conditions upon demonstration by the Licensee of good cause. The following demonstrate OPPD's basis for relaxation of the requirement to fully implement both Order's December 31, 2016, deadline.

### **Order EA-12-049**

As described in the FCS Updated Final Safety Analysis Report (UFSAR), SFP cooling is provided by Component Cooling Water (CCW) circulating through the SFP heat exchanger. CCW is cooled by Raw Water (RW) with RW taking suction from the Missouri River which is the Ultimate Heat Sink (UHS). The spent fuel pool cooling pump takes a suction from the pool and circulates water through the SFP heat exchanger.

With all fuel moved to the SFP by December 31, 2016, ELAP events will only impact the fuel in the SFP and mitigating strategies are limited to maintaining the integrity of the fuel in the SFP. An ELAP event would result in the loss of SFP cooling and the spent fuel pool will begin to heat up. With all the fuel removed from the RPV to the SFP within 30 days of reactor shutdown (i.e. 30 days decay) and without a SFP cooling system, the approximate time to boil (200°F) would be 12 hours. Assuming the same conditions with 60 days of decay the approximate time to boil (200°F) would be 15 hours.

OPPD's bases for relaxation of the requirement to fully implement Order EA-12-049 by the December 31, 2016, deadline are:

1. Existing procedures for mitigating an ELAP affecting the SFP
2. Existing guideline for mitigating an ELAP affecting the SFP
3. Existing guidelines to maintain SFP inventory in the event of beyond design basis (BDB) flooding
4. Implementation of an Overall Integrated Plan (OIP) for Fuel Permanently Removed from RPV to SFP.
5. Enhanced offsite and onsite communication capability
6. Availability of additional offsite resources

### **1. Existing Procedures for Mitigating a Loss of SFP Cooling**

AOP-36, Loss of Spent Fuel Pool Cooling, Attachment G, "Spent Fuel Pool Makeup During Station Blackout," establishes makeup to the SFP using a fire hose connected to the Fire Protection System using one of three water sources

- Blair water main
- Fire Water Storage Tank
- River water supplied by the diesel fire pump

### **2. Existing Guideline for Mitigating a Loss of SFP Cooling during a BDB Event**

Operational Contingency Action Guideline 1 (OCAG-1) is in place to minimize the potential release of radioactive material due to a wide variety of BDB events that range from localized damage events to major seismic, fire, and explosion events that result in the loss of a large area of the plant in which spent fuel cooling is jeopardized (Reference 9). OCAG-1 satisfies section B.5.b of NRC Order EA-02-026 and the FCS Facility Operating License Condition 3.G. The strategies and equipment established by B.5.b and maintained by regulation perform a similar function as the requirements of NRC Order EA-12-049. Section III of OCAG-1 provides guidance on methods of providing makeup for boil-off if cooling is lost to the SFP using a fire engine supplied by the site fire main. A Note is included in multiple sections of the OCAG-1 to use a trailer mounted pump to obtain water from the river and provide it to the fire header if the Fire Protection System is unavailable.

### **3. Existing BDB Flooding Guidelines**

Guidelines (OCAGs 2, 3 and 4) and associated equipment are in place to maintain SFP inventory in the event of a BDB flood (References 10, 11 and 12). The NRC Resident Inspectors completed an inspection (Reference 13) of these guidelines and equipment using the NRC's Temporary Instruction (TI) 2515/190, "Inspection of the Licensee's Proposed Interim Actions as a Result of the Near-Term Task Force Recommendation 2.1 Flooding Reevaluation."

OCAGs 2, 3 and 4 implement strategies to maintain fuel integrity in both the RPV and SFP. The strategy to maintain SFP inventory is illustrated in Figures 1 and 2. Key elements of this strategy are:

- Water is supplied to the SFP from the Safety Injection Refueling Water Tank (SIRWT) using one of two redundant submersible pumps placed in the SIRWT through hoses and the valve manifold
- The submersible pump is powered by one of two redundant mobile diesel generators (60 Hz, 30 kW - 480VAC 3 phase)
- Fuel for the diesel generator is stored in the fuel bladder
- Steam and water vapor are released through holes drilled in the roof of the Auxiliary Building which houses the SFP
- Flood water will replenish the SIRWT.
- The SFP level is monitored using a portable instrument.
- The portable equipment (generators, pumps, SFP monitoring instrument, fuel bladder, hoses and fittings) is stored on the turbine deck at elevation 1036' MSL.
- Portable equipment is deployed to the locations shown in Figure 2 for some dam failures identified in References 14 and 15 when deployment on the 1036' MSL elevation is sufficient to protect the equipment.
- Portable equipment is deployed to alternate locations at higher elevations in OCAGs 3 and 4 for other dam failures identified in References 14 and 15.

Figure 1 - Flow Path to Maintain SFP Inventory

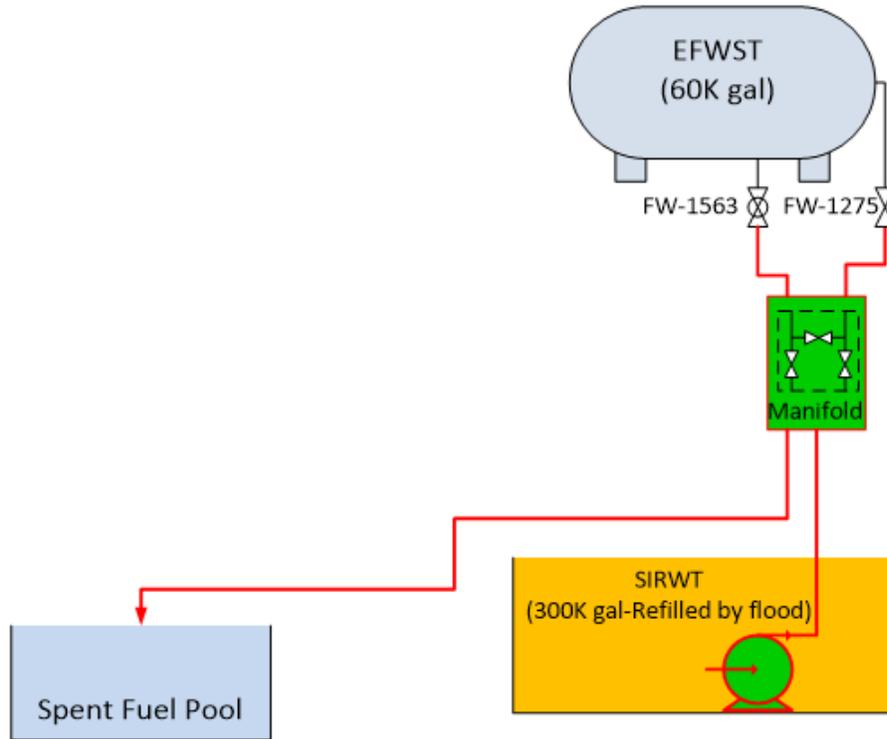
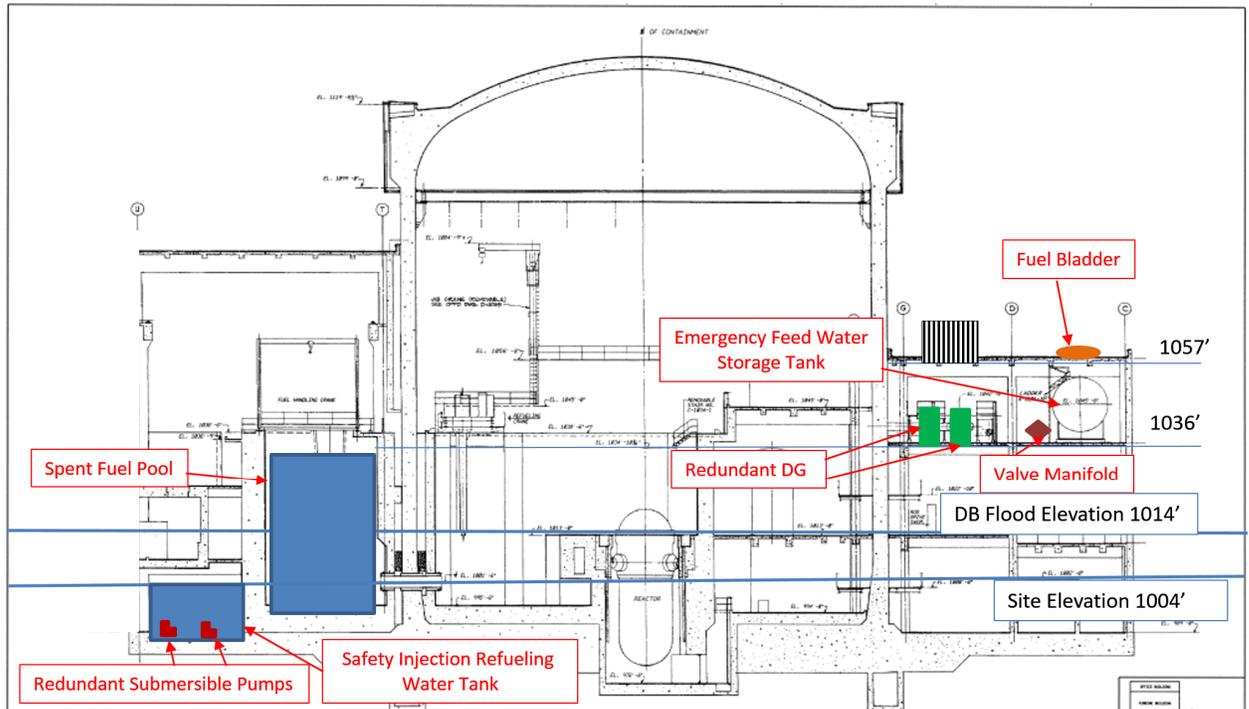


Figure 2 – Equipment Deployed to Maintain SFP Inventory



#### **4. FCS Overall Integrated Plan (OIP) for Fuel Permanently Removed from RPV to SFP**

The Attachment provides key elements of a new OIP that differ from elements of the current OIP [Reference 3 as updated in the six month reports and information provided during the audit (Reference 7)]. Substantial time will be available to implement the mitigating strategies since the approximate time to boil (200°F) 30 days after reactor shutdown would be 12 hours and 15 hours with 60 days of decay. The following elements will be included in the new OIP:

- General Integrated Plan Elements
- Maintain Spent Fuel Pool Cooling
- Safety Functions Support
  - Installed Equipment Phase 1 (As stated in the current OIP there are no Phase 1 actions for SFP cooling.)
  - Portable Equipment Phase 2
  - Portable Equipment Phase 3

The following elements are removed since they are no longer applicable:

- Maintain Core Cooling & Heat Removal
- Maintain RCS Inventory Control
- Maintain Containment.

A new OIP for Fuel Permanently Removed from the RPV to the SFP will be submitted by October 30, 2016, Phase 2 strategies will implemented by December 31, 2016 and Phase 3 strategies will implemented by August 31, 2017.

#### **5. Offsite and Onsite Communications**

During an event multiple communications means are available including the FCS Plant Paging system (Gai-Tronics), land line phone systems, commercial cell phones, 800 MHz radios, and satellite phones.

FCS maintains an 800 MHz portable handheld radios for emergency use. 800 MHz radios are available throughout the plant and at all Emergency Response Facilities (ERF)

- Control Room (CR)
- Technical Support Center (TSC)
- Operations Support Center (OSC)
- Emergency Operations Facility (EOF)
- Security
- County Emergency Operations Centers (EOC)

Handheld satellite phones are distributed in the ERF. Satellite phones are located in the Control Room, the TSC, the OSC, and with the Security organization. Portable diesel generators are available to provide charging power for the radios and satellite handsets. Additional batteries and battery chargers are available at the ERF.

In addition FCS has enhanced communication capability with:

- a. A self-powered 800 MHz portable site with radio repeaters and antenna is available and can be deployed in case the installed radio repeaters and antenna are damaged.
- b. Installation of cell phone boosters in the TSC and OSC.
- c. Installation of an external satellite phone antenna that allows use of satellite phones in the CR and TSC

#### **6. Additional Off-site Resources**

FCS has access to additional equipment that can be provided through agreements with other parties that would enhance and improve the current strategies. For example:

1. OPPD, as an integrated utility, has equipment located throughout eastern Nebraska that would support any event.
2. OPPD will remain a member of SAFER through our Pooled Inventory Management contract until August 2017.

On June 24, 2016, OPPD submitted its certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i) and 10 CFR 50.4(b)(8) (Reference 8) for FCS. It specified a shutdown date prior to December 31, 2016. The preceding material documents OPPD's basis for the relaxation request of the EA-12-049 schedule from December 31, 2016 to August 31, 2017.

#### **Order EA-12-051**

The SFP relies on maintenance of an adequate inventory of water under accident conditions to provide containment, as well as the cooling and shielding safety functions. If the failure of the forced cooling system starts to affect SFP level then makeup water is needed. During the events in Fukushima, responders were without reliable instrumentation to determine water level in the SFP. This caused concerns that the pool may have boiled dry, resulting in fuel damage. Fukushima demonstrated the confusion and misapplication of resources that can result from Beyond-Design-Basis External Events (BDBEE) when adequate instrumentation is not available.

SECY-15-0081 Section 7 of Enclosure 1 (Reference 16), addresses the applicability of Lessons Learned from the Fukushima-Dai-Chi Accident to Decommissioning Reactors and Complex Materials Facilities and provides an Assessment for Decommissioned Power Reactors with Irradiated Fuel Stored in Spent Fuel Pools. This Assessment for power reactors shutdown permanently, fuel removed from their reactor vessels, spent fuel stored in SFPs, as well as in independent spent fuel storage installations (ISFSIs) is based on actions taken for Crystal River Unit 3, Kewaunee, San Onofre 2 and 3, and Vermont Yankee. As stated in the SECY:

The basis for rescinding Order EA-12-051 is that because the licensees certified the permanent removal of fuel from the reactor vessel, the SFP becomes the primary safety concern for site personnel. In the event of a challenge to the safety of fuel stored in the SFP, decision-makers would not have to prioritize actions and the focus of response personnel would be on the SFP. Thus, the basis for this order no longer applies.

OPPD's bases for relaxation of the requirement to fully implement Order EA-12-051 by the December 31, 2016, deadline are:

1. Removal of fuel from the RPV to the SFP
2. Installation of the SFP level instrument
3. Implementation of an Overall Integrated Plan (OIP) for Fuel Permanently Removed from RPV to SFP

On June 24, 2016, OPPD submitted its certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i) and 10 CFR 50.4(b)(8) (Reference 8) for FCS. It specified a shutdown date prior to December 31, 2016. The preceding paragraph documents OPPD's basis for the request for relaxation of EA-12-051 from December 31, 2016 to August 31, 2017.

If you should have any questions regarding this submittal or require additional information, please contact Mr. Bradley H. Blome at 402-533-7270.

No commitments to the NRC are made in this letter.

Respectfully,



Shane M. Marik  
Site Vice President and CNO

SMM/epm

Attachment

- c: K. M. Kennedy, NRC Regional Administrator, Region IV  
P. J. Bamford, NRC Project Manager  
C. F. Lyon, NRC Project Manager  
S. M. Schneider, NRC Senior Resident Inspector

### References

1. NRC Order, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, EA-12-049, dated March 12, 2012 (ML12054A735)
2. NRC Order, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, EA-12-051, dated March 12, 2012 (ML12056A044)
3. OPPD letter (L. Cortopassi) to USNRC (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 (LIC-13-0019)(ML13064A298)
4. NRC Letter (J. Bowen) to OPPD (L. Cortopassi), 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).
5. OPPD letter (L. Cortopassi) to USNRC (Document Control Desk), "Fort Calhoun Station Spent Fuel Pool Instrumentation Overall Integrated Plan," dated February 28, 2013 (LIC-13-0011)(ML13059A268)
6. NRC Letter (P. Bamford) to OPPD (S. Marik), Plan for the Onsite Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (CAC NOS. MF0969 AND MF0968), dated March 8, 2016 (ML16064A077)
7. NRC Letter (P. Bamford) to OPPD (S. Marik), "Fort Calhoun Station, Unit 1 - Report for the Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (CAC NOS. MF0969 AND MF0968)," dated July 5, 2016 (ML16179A373) (NRC-16-0061)
8. OPPD letter (T. Burke) to USNRC (Document Control Desk), "Certification of Permanent Cessation of Power Operations," dated June 24, 2016 (LIC-16-0043)
9. OPPD letter (H. Faulhaber) to USNRC (Document Control Desk), "Revised Fort Calhoun Station Unit No. 1, Response Providing Information Regarding Implementation Details for the Phase 2 and 3 Mitigation Strategies," dated May 4, 2007 (LIC-07-0030)
10. OPPD letter (L. Cortopassi) to NRC (Document Control Desk), "Superseding Omaha Public Power District's (OPPD) Response to NRC Request for a Timeline to Implement Strategies at Fort Calhoun Station Unit 1 to Address Higher Flooding Hazards Relative to the Design Basis," dated October 26, 2013, (LIC-13-0140) (ML13310A889)
11. OPPD letter (L. Cortopassi) to USNRC (Document Control Desk), "Extension Request - Response to March 12, 2012, Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 2, Flooding Hazard Reevaluation Report," dated June 5, 2014 (LIC-14-0078)(ML14167A344)
12. NRC Letter (J. Sebrosky) to OPPD (L. Cortopassi), "Fort Calhoun Station, Unit No. 1 – Transmittal of U.S. Army Corps of Engineers Flood Hazard Reevaluation Information," dated April 4, 2014 (ML14091A345)
13. NRC letter (J. Josey) to OPPD (S. Marik), "Fort Calhoun Station – NRC Integrated Inspection Report Number 05000285/2016001," dated April 20, 2016 (NRC-16-0037)(ML16111B099)

14. OPPD letter (E. Dean) to USNRC (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) (ML15042A127)
15. OPPD letter (L. Cortopassi) to USNRC (Document Control Desk), "Addendum to 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 November 4, 2015 (LIC-15-0129) (ML15310A018)
16. NRC Policy Issue, SECY-15-0081, Staff Evaluation of Applicability of Lessons Learned from the Fukushima-Dai-Chi Accident to Facilities other than Operating Power Reactor, dated June 9, 2015 (ML15050A066)

**Attachment**  
**Elements of the FCS Overall Integrated Plan (OIP) for Fuel Permanently Removed from**  
**Reactor Pressure Vessel (RPV) to Spent Fuel Pool (SFP)**

<b>General Integrated Plan Elements</b>	
<b>Element</b>	<b>Discussion</b>
Applicable Extreme External Hazard	The applicable extreme external hazards for Fort Calhoun Station (FCS) remain the same as identified in the existing OIP.
<p><u>Seismic Hazard Assessment</u>            The seismic hazards assessment has been completed and the spectra of the FCS UFSAR continues to be applicable. The completed liquefaction analysis shows access to the plant is maintained. No changes to the existing OIP are needed as a result of the seismic re-evaluation.</p> <p><u>External Flood Hazard Assessment</u>            The Flooding Hazard Reevaluation Report has been completed (References 14 and 15). The flooding hazards applicable to FCS with all fuel in the SFP and the capability of the new OIP to mitigate the re-evaluated flooding will be provided in the October 2016 submittal.</p>	
Sequence of events and identify any time constraint required for success including the technical basis for the time constraint.	The following is a general discussion of expected action based on preliminary SFP temperature and inventory calculations. Additional details will be provided in the October 2016 submittal.
<p>T=0: Initiation of Station Blackout (SBO).</p> <p>T+1 min: 125 VDC/120VAC buses powered from station batteries. Operators enter emergency operating procedures (EOPs), transitioning to SBO procedure. Key actions within procedures include:</p> <ul style="list-style-type: none"> <li>• Verification of system response to ensure safety functions is satisfied.</li> <li>• Attempting alternate methods of starting/loading station Emergency Diesel Generators (EDG)</li> </ul> <p>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).</p> <p>T+1 hr: Initial actions taken under EOP direction complete. Operations personnel survey plant for damage and evaluate likelihood of EDG recovery within 4 hours (FCS design SBO coping period)</p> <p>T+2 hr: Assessment of EDG status indicates recovery not likely within 4 hours. ELAP declared. Operators implement FLEX support guideline (FSG).</p> <p>T+? hr: Operators will establish path the vent steam and water vapor from the Auxiliary Building. Method and timing will be reported in the October 2016 submittal.</p>	

T+24hr: Establish Spent Fuel Pool (SFP) cooling by starting SFP makeup. Boiling in the SFP will start in approximately 12 hours, 30 days after shutdown, and approximately 15 hours, 60 days after shutdown. Boil off from SFP will result in SFP level reduction to top of active fuel in approximately 101 hours assuming ELAP initiation 30 days after shutdown and approximately 129 hours assuming ELAP initiation 60 days after shutdown. Makeup flow rate will be established to maintain SFP level between normal water level and SFPI Level 2. Makeup flow rates of approximately 25 gpm, assuming ELAP initiation 30 days after shutdown, and approximately 20 gpm, assuming ELAP initiation 60 days after shutdown, are needed to maintain the SFP level.

T+72 hr: Establish makeup to SIRWT from an alternate source of water (UHS - Missouri River). Based on makeup needs to the SFP and using conservative assumptions for available water from the SIRWT, the SIRWT will be depleted in approximately 12 days assuming ELAP initiation 30 days after shutdown and approximately 15 days assuming ELAP initiation 60 days after shutdown.

Deployment mode	Fuel Permanently Removed from RPV to SFP
Time line for implementation	Phase 2 FLEX Support Guideline(s) will be implemented by December 31, 2016 and Phase 3 by August 31, 2017.

<b>Maintain Spent Fuel Pool Cooling</b>	
<b>PWR Portable Equipment Phase 2:</b>	
<p>It is noted that that the evaporation and/or boiling of the SFP will cause high humidity and steam inside the FHB. Ventilation will have to be provided. Details of FHB ventilation will be developed and submitted in October 2016 submittal.</p> <p>The following options will be used to refill the SFP:</p> <ul style="list-style-type: none"> <li>• SIRWT water using the submersible pump (See Figure 1)</li> <li>• EFWST water drained to the SIRWT water and using the submersible pump (See Figure 1), or</li> <li>• UHS using a portable pump to replenish the SIRWT water and using the submersible pump</li> </ul>	
<b>Details:</b>	
<b>Guidelines</b>	FSG(s) will implement this strategy.
<b>Modifications</b>	Permanent piping has been installed to facilitate transfer of water.
<b>Storage / Protection of Equipment:</b>	
<p>FCS will store the portable equipment either within the safety-related plant structures or in the FLEX storage building that meets the NEI 12-06 protection guidelines. For BDB flooding scenarios the October 2016 submittal will address protection and deployment of equipment.</p>	
<b>PWR Portable Equipment Phase 3:</b>	
<p>Phase 2 strategies can be continued for an indefinite time with extra fuel supplies brought in from offsite. However, for long term cooling of SFP, the concern of steam and vapor in the FHB needs to be addressed. If available, the fuel pool cooling system can be used with power from a portable DG brought in from offsite; otherwise portable heat exchangers and pumps will need to be brought in as well. Further details of coping in Phase 3 will be provided in the October 2016 submittal.</p>	