

# **Ameren Missouri'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**

## **1 Introduction**

Ameren Missouri developed an Overall Integrated Plan (OIP) (Reference 1) for the Callaway Plant, documenting the diverse and flexible strategies (FLEX), in response to NRC Order Number EA-12-049 (Reference 2). This enclosure provides an update of milestone accomplishments since submittal of the last status report (Reference 12), including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any. Refer to Section 8 of this enclosure for a list of References.

## **2 Milestone Accomplishments**

The following milestones have been completed since the development of the OIP, and are current as of August 14, 2014.

- FLEX Strategy Evaluation is complete
- PWROG has issued the NSSS-specific guidance
- Submittal of first six-month status report (Reference 3)
- Modification Evaluations have been completed
- Submittal of second six-month status report (Reference 12)
- Submittal of the third six-month status report (this submittal)

## **3 Milestone Schedule Status**

The following table provides an update to Attachment 2 of the OIP. The table provides the activity status of each item, and indicates whether the expected completion date has changed. The dates are planning dates subject to change as design and implementation details are developed. The milestone target completion dates have been revised based on approval of the relaxation request discussed in Section 5. Italicized text denotes that a Milestone was updated since the prior six-month status update (Reference 12).

<b>Callaway Milestone Schedule</b>			
<b>Activity</b>	<b>Original Target Date</b>	<b>Status (Will be updated every 6 months)</b>	<b>Revised Target Completion Date</b>
<b>Submit Overall Integrated Implementation Plan</b>	February-2013	Complete	
<b>6 Month Status Updates</b>			
Update 1	August-2013	Complete	
Update 2	February-2014	Complete	
<i>Update 3</i>	<i>August-2014</i>	<i>Complete</i>	
Update 4	February-2015	Not Started	
Update 5	August-2015	Not Started	
Update 6	February-2016	Not Started	
<b>FLEX Strategy Evaluation</b>	April-2013	Complete	
<b>Perform Staffing Analysis</b>	December-2013	Not Started	December-2015
<b>Modifications</b>			
Modifications Evaluation	April-2013	Complete	
Engineering and Implementation	November-2014	Started	May-2016
N-1 Walkdown	April-2013	Started	December-2014
Design Engineering	March-2014	Started	February-2015
Unit 1 Implementation Outage	November-2014	Not Started	May-2016
<b>On-site FLEX Equipment</b>			
Purchase	June-2013	Started	March-2015
<i>Procure</i>	<i>December-2013</i>	<i>Started</i>	<i>April-2016</i>
<b>Off-site FLEX Equipment</b>			
Develop Strategies with RRC	November-2013	Started	September-2014
Install Off-site Delivery Station (if necessary)	September-2014	Started	
<b>Procedures</b>			
PWROG issues NSSS-specific guidelines	June-2013	Complete	
Create Callaway FSG	April-2014	Started	April-2015
Create Maintenance Procedures	June-2014	Not Started	June-2015
<b>Training</b>			
Develop Training Plan	April-2014	Started	<i>December-2014</i>
Implement Training	May-2014	Started	May-2016
<b>Submit Completion Report</b>	<i>November-2014</i>	<i>Not Started</i>	<i>July-2016</i>

## **4 Changes to Compliance Method**

The following changes have been made to Ameren Missouri's Overall Integrated Plan (OIP) (Reference 1) since submittal of the Second Six-Month Status Report (Reference 12).

### **4.1 Sequence of Events**

Since Ameren Missouri will construct a new Hardened Condensate Storage Tank (HCST) to ensure availability of approximately 72 hours of protected water source for the safety function of core cooling, there will not be a need to "Align CST Makeup from the UHS" within 17 hours of the event. Therefore, this activity will be removed from the Enclosure to Reference 1 (Item 12 on page 12 of 131).

### **4.2 Maintain Core Cooling and Heat Removal**

As delineated on pages 26 and 27 of Ameren Missouri's OIP (Reference 1), the implementation plan for Core Cooling with Steam Generators Not Available (Modes 5 and 6) strategy has changed. The original plan was to mount permanently installed piping and conduit in the Containment Tendon Access Gallery. The piping would be connected to hoses from the FLEX Core Cooling Pump on one end and to hoses to the Safety Injection System in the "A" piping penetration room (Room 1323) (primary strategy) or to the Boron Injection Header piping (Room 1126) (secondary strategy). Ameren Missouri has changed the plan so that piping/hoses will run through Door DSK13011 into the Auxiliary Building near the RWST. Since the FLEX Core Cooling Pump will be staged outside the Auxiliary Building, additional conduit will not be required. The suction source (RWST) and the permanent piping connections in the Auxiliary Building for this strategy have not changed.

### **4.3 Maintain RCS Inventory Control**

Power to the High Pressure Electric RCS Pump was to be supplied by a small generator deployed outside the Tendon Access Gallery. Conduit and cable were going to be permanently mounted in the Tendon Access Gallery. Temporary cables were to be used to connect the portable generator to the permanently mounted cable in the Tendon Access Gallery on one end and then to the High Pressure Electric RCS Pump staged in the Auxiliary Building on the other end. Ameren Missouri will now install a power panel on the 1974 elevation of the Auxiliary Building to be supplied by the 480-VAC FLEX Diesel Generators. This power panel will be used to provide power to the High Pressure Electric RCS Pump.

#### **4.4 Spent Fuel Pool Temperature**

Further evaluation has concluded that monitoring of the Spent Fuel Pool (SFP) temperature is not warranted. With the installation of the Westinghouse Spent Fuel Pool Instrumentation System, operators will be able to monitor the SFP water level. The SFP temperature will go to and remain at the boiling point for atmospheric conditions as the water in the SFP boils. Ameren Missouri will implement modifications to provide make-up and spray capability to the SFP as required by NEI 12-06 to ensure that sufficient water remains in the SFP to prevent fuel damage.

#### **4.5 New Hardened Condensate Storage Tank**

Ameren Missouri will construct a new Hardened Condensate Storage Tank (HCST) that will meet FLEX and Expedited Seismic Evaluation Process (ESEP) requirements. The new HCST, in conjunction with the current Condensate Storage Tank (CST), will provide approximately 72 hours of protected water source for the safety function of core cooling. The new HCST will not replace the current CST since the CST is the design basis source of water for the Auxiliary Feedwater Pumps. The design of the new HCST will utilize Regulatory Guide 1.76 Revision 1 for wind loading design criteria. Regulatory Guide 1.76 Revision 1 is the latest NRC approved standard for design-basis tornado and design-basis tornado-generated missiles that a nuclear power plant should be designed to withstand.

#### **4.6 Storage/Protection of Equipment**

Ameren Missouri has decided on a single FLEX storage building to provide reasonable protection, storage, and deployment of the equipment associated with Order EA-12-049. The FLEX storage building will meet the requirements of NEI 12-06, with the exception of the building roll-up door(s). NEI 12-06 Section 7.3.1 states that FLEX equipment should be stored "in a structure that meets the plant's design basis for high wind hazards." For Callaway, this would require the use of Regulatory Guide 1.76, Revision 0 for the design of the new FLEX storage building and its associated door(s). As an alternative to NEI 12-06 FLEX storage building design requirements, Regulatory Guide 1.76 Revision 1 will be utilized for the design. Regulatory Guide 1.76 Revision 1 is the latest NRC approved standard for design-basis tornado and design-basis tornado-generated missiles that a nuclear power plant should be designed to withstand.

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

In Reference 13, Ameren Missouri formally requested relief from the requirement of Section IV.A.2 of the Order (EA-12-049) regarding full implementation no later than two (2) refueling cycles after submittal of the Overall Integrated Plan. NRC approval of the requested relief was received in Reference 14, relaxing full Order implementation for Callaway Plant until the completion of the spring 2016 refueling outage. The milestone schedule in Section 3 has been updated for consistency with the approved schedule relief. No additional relief is requested herein.

## 6 Open Items from Overall Integrated Plan and Interim Safety Evaluation

The following tables provide a summary of the open items documented in the OIP or the Interim Safety Evaluation (SE) and the status of each item.

Overall Integrated Plan Open Item	Status
<p>OI2 GOTHIC analysis needs to be performed to demonstrate that Containment pressure and temperature remain at acceptable levels and that instrumentation EQ requirements will be maintained.</p>	<p>Started. The Gothic Analysis and Instrumentation EQ Analysis for all modes of operation are being performed. The results are currently under review.</p>
<p>OI5 The current CST and CST pipe chase are non-seismic. Callaway may pursue the construction of a new seismically qualified and missile protected CST. Current FLEX strategies rely on the existing CST tank. Future evaluation is required to determine the impact on FLEX strategies should the new CST be constructed.</p>	<p>Started. Ameren Missouri will construct a new Hardened Condensate Storage Tank (HCST) that is seismically qualified and missile protected. Relaxation of Order requirements regarding the date of full implementation was requested (Reference 4) and has been approved (Reference 5). FLEX Support Guidelines (FSG) will be developed for use of the new HCST.</p>
<p>OI8 The Westinghouse RCP SHIELD® Seal issue has not been resolved.</p>	<p>Complete. This issue has been resolved. NRC Endorsement of TR-FSE-14-1-P, RCP SHIELD Seal is documented in NRC Letter from Mr. Jack Davis, Director, Mitigating Strategies Directorate to Mr. James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, dated May 28, 2014 (ML14132A128).</p>

Interim Safety Evaluation Open Item	Status
<p>3.2.1.2.B RCP Seal O-Ring Integrity and Leakage Rate</p> <p>Additional review of the licensee's applicable analysis and relevant Reactor Coolant Pump (RCP) seal leakage testing data is needed to justify that (1) the integrity of the associated O-rings will be maintained at the temperature conditions experienced during the ELAP event, and (2) the seal leakage rate used in the ELAP is adequate and acceptable.</p>	<p>Complete.</p> <p>This issue has been resolved. NRC Endorsement of TR-FSE-14-1-P, RCP SHIELD Seal is documented in NRC Letter from Mr. Jack Davis, Director Mitigating Strategies Directorate to Mr. James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, dated May 28, 2014 (ML14132A128).</p>
<p>3.2.1.2.D RCP Seal Leakage Rate</p> <p>The acceptability of the use of the selected seals and the RCP seal leakages rates in the ELAP analysis must be justified.</p>	<p>Complete.</p> <p>This issue has been resolved. NRC Endorsement of TR-FSE-14-1-P, RCP SHIELD Seal is documented in NRC Letter from Mr. Jack Davis, Director, Mitigating Strategies Directorate to Mr. James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, dated May 28, 2014 (ML14132A128).</p>
<p>3.2.1.3.A Specify Key Parameters</p> <p>During the NRC audit process the licensee was requested to provide the following information: If the ANS 5.1-1979 + 2 sigma model is used in the ELAP analysis, specify the values of the following key parameters used to determine the decay heat: (1) initial power level, (2) fuel enrichment, (3) fuel burnup, (4) effective full power operating days per fuel cycle, (5) number of fuel cycles, if hybrid fuels are used in the core, and (6) fuel characteristics based on the beginning of the cycle, middle of the cycle, or end of the cycle. Address the adequacy of the values used. If the different decay heat model is used, describe the specific model and address the acceptability of the model and the analytical results.</p>	<p>Started.</p> <p>Ameren Missouri will provide the requested information.</p>

<b>Interim Safety Evaluation Open Item</b>	<b>Status</b>
<p>3.2.1.8.B Boric Acid Mixing</p> <p>The Pressurized-Water Reactor Owners Group submitted to the NRC a position paper, dated August 15, 2013, which provides test data regarding boric acid mixing under single-phase natural circulation conditions and outlined applicability conditions intended to ensure that boric acid addition and mixing would occur under conditions similar to those for which boric acid mixing data is available.</p> <p>During the audit process, the licensee informed the NRC staff of its intent to abide by the generic approach discussed above; however, the NRC staff concluded that the August 15, 2013, position paper was not adequately justified and that further information is required.</p>	<p>Started.</p> <p>The NRC has subsequently endorsed the position paper with some clarifications (Reference 9).</p> <p>Ameren Missouri will evaluate the clarifications and update the OIP, as needed.</p>
<p>3.2.4.9.A Fuel Oil Quality</p> <p>Information is needed regarding plans for assuring and maintaining fuel oil quality.</p>	<p>Started.</p> <p>Ameren Missouri will provide the requested information.</p>
<p>3.4.A Offsite Resource Capabilities</p> <p>Details are needed to demonstrate the minimum capabilities for offsite resources will be met per NEI 12-06 Section 12.2.</p>	<p>Started.</p> <p>Ameren Missouri will provide the requested information.</p>

<b>Interim Safety Evaluation Confirmatory Item</b>	<b>Status</b>
<p>3.1.3.3.A - The licensee did not provide information with regard to procedural interface considerations as they relate to tornados.</p>	<p>Started.</p> <p>The following will be added to the Ameren Missouri Overall Integrated Plan:</p> <p>Tornados are generally fast moving events and over quickly. OTO-ZZ-00012, Severe Weather, provides instructions to prepare the plant for severe weather conditions and a potential station blackout. Ameren Missouri has identified multiple deployment routes for the FLEX portable equipment in the event of damage to the deployment routes. Ameren Missouri has also developed FLEX Support Guideline FSG-5, Initial Assessment And Flex Equipment Staging, to provide guidelines to establish clear access routes and for the deployment of the portable FLEX Equipment.</p>

<p align="center"><b>Interim Safety Evaluation Confirmatory Item</b></p>	<p align="center"><b>Status</b></p>
<p>3.2.1.A – Potential Nitrogen Injection from Accumulators into RCS</p> <p>The licensee needs to confirm that adverse quantities of nitrogen from accumulators will not be injected into the RCS during an ELAP event using an acceptable methodology that accounts for the potential for heat transfer from the containment building to the contents of the accumulator.</p>	<p>Complete.</p> <p>Step 1 of FSG-10, “Passive RCS Injection Isolation (Rev. 0),” determines if isolation of Safety Injection (SI) Accumulators is desired. If the Steam Generators will be depressurized below 220 psig, then the SI accumulators are isolated by closure of their discharge isolation valves (if power is available from FLEX 480 VAC Generator) or vented to the containment atmosphere. Callaway Energy Center calculation, BB-180 Rev.0 Add. 5 “Minimum Steamline Pressure to Prevent Accumulator Nitrogen Injection,” establishes the site specific value for the Westinghouse Owners Group Emergency Response Guidelines Setpoint O.07 that is used in the Emergency Operating Procedures (i.e., ECA-0.0, “Loss of All AC Power,” Step 17, Rev. 019). The site calculation takes into consideration the potential for nitrogen expansion/SI accumulator pressure increase from heat sources within the containment building (i.e., RCS).</p>
<p>3.2.1.1.A – Use of NOTRUMP Computer Code</p> <p>Reliance on the NOTRUMP code for the ELAP analysis of Westinghouse plants is limited to the flow conditions prior to reflux condensation initiation. This includes specifying an acceptable definition for reflux condensation cooling.</p>	<p>Complete.</p> <p>Ameren Missouri has used generic plant ELAP analyses performed with the NOTRUMP computer code to support the mitigating strategy in its Overall Integrated Plan (OIP). The use of NOTRUMP was limited to the thermal-hydraulic conditions before reflux condensation initiates. The initiation of reflux condensation cooling is defined when the one-hour centered moving average (CMA) of the flow quality at the top of the SG U-tube bend exceeds 0.1 in any one loop.</p>
<p>3.2.1.2.C – RCP SHEILD SEAL Part 21 Report</p> <p>Further information is required to assess address the impacts of the Westinghouse 10 CFR Part 21 report, “Notification of the Potential Existence of Defects Pursuant to 10CFR Part 21,” dated July 26, 2013 (ADAMS Accession No. ML 13211A168) on the use of the low seal leakage rate in the ELAP analysis.</p>	<p>Complete.</p> <p>This issue has been resolved. NRC Endorsement of TR-FSE-14-1-P, RCP SHIELD Seal is documented in NRC Letter from Mr. Jack Davis, Director Mitigating Strategies Directorate to Mr. James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company LLC, dated May 28, 2014 (ML14132A128).</p>



<b>Interim Safety Evaluation Confirmatory Item</b>	<b>Status</b>
<p>3.2.1.5.A - The Integrated Plan did not address whether instrumentation credited in the ELAP analysis for automatic actuations and for indications required for the operators to take action are reliable and accurate in the containment harsh conditions. The licensee responded to this question in the audit process by pointing out that the licensee's self-identified open item related to the containment environment (01 2) addresses this issue. The licensee also stated that Westinghouse will be asked to perform a GOTHIC analysis of the containment to demonstrate that acceptable temperature and pressure levels will not be exceeded.</p>	<p>Started. The Gothic Analysis and Instrumentation EQ Analysis for all modes of operation are being performed. The results are currently under review.</p>
<p>3.2.2.A – SFP Cooling Connection Points The licensee stated the water supply for SFP cooling involves three connections points, all located on the exterior of the fuel building. The connection points on the exterior of the fuel building will need to be protected from high wind missile strikes. If protection is not possible, the connection points will need to be relocated to the inside of the building. The configuration needs to be resolved.</p>	<p>Complete. ULNRC-06087, Ameren Missouri’s second six-month OIP submittal update (Reference 12), section 4.4, stated that the three connections (primary, secondary, and spray) for the Spent Fuel Pool Cooling strategy had been revised to place these connections just inside the building. An evaluation determined that the connection points would accessible early in the event.</p>

## 7 Potential Interim Safety Evaluation Impacts

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

## 8 References

The following references support the updates to the OIP described in this enclosure.

1. ULNRC-05962, "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," dated February 28, 2013
2. NRC Order Number EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012
3. ULNRC-06024, "First Six-Month Status Report In Response To March 12, 2012 Commission Order Modifying Licenses With Regard To Requirements For Mitigation Strategies For Beyond-Design-Basis External Events (Order Number EA-12-049)," dated August 29, 2013
4. ULNRC-06036, Request For Relaxation From NRC Order EA-12-049, "Order Modifying Licenses With Regard To Requirements For Mitigation Strategies For Beyond-Design-Basis External Events," dated October 09, 2013
5. ML13319A668, Callaway Plant, Unit 1- Relaxation Of The Scheduler Requirements For Order EA-12-049 "Issuance Of Order To Modify Licenses With Regard To Requirements For Mitigation Strategies For Beyond Design Basis External Events," dated December 11, 2013
6. ML133224A195, Callaway Plant, Unit 1 - Interim Staff Evaluation Relating To Overall Integrated Plan In Response To Order EA-12-049 (Mitigation Strategies) (TAC No. MF0772), dated December 19, 2013
7. ML13273A514, NEI Shutdown/Refueling Modes White Paper, Rev 0 9/18/13
8. ML13267A382, NRC Letter from Mr. Jack Davis, NRC, to Mr. Joseph E. Pollock, NRC Endorsement of FLEX Generic Open Item for Shutdown Refueling Modes, dated September 30, 2013
9. ML13276A183, NRC Letter from Mr. Jack Davis, NRC, to Mr. Jack Stringfellow, PWROG, NRC Endorsement of PWROG Boron Mixing White Paper, dated January 8, 2014
10. ML13241A186, NEI Letter from Mr. Nicholas Pappas to NRC, Mr. Jack R. Davis, EA-12-049 Mitigating Strategies Resolution of Extended Battery Duty Cycles Generic Concern, dated August 27, 2013
11. ML13241A188, NRC Letter from Mr. Jack Davis, NRC, to Mr. Joseph E. Pollock, Battery Life White Paper Endorsement, dated September 16, 2013
12. ULNRC-06087, Second Six-Month Status Report In Response To March 12, 2012 Commission Order Modifying Licenses With Regard To Requirements For Mitigation Strategies For Beyond-Design-Basis External Events (Order Number EA-12-049)
13. ULNRC-06131, Request For Relaxation From NRC Order EA-12-049, "Modifying Licenses With Regard To Requirements For Mitigation Strategies For Beyond-Design-Basis External Events"
14. ML13319A668, Callaway Plant Unit 1 – Relaxation of the Scheduler Requirements for Order EA-12-049 Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events.