



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 27, 2015

Mr. Mano Nazar
President and Chief Nuclear Officer
Florida Power and Light Company
P.O. Box 14000
700 Universe Boulevard
Juno Beach, FL 33408-0420

SUBJECT: ST. LUCIE PLANT, UNIT NOS. 1 AND 2 - REPORT FOR THE ONSITE AUDIT REGARDING IMPLEMENTATION OF MITIGATING STRATEGIES AND RELIABLE SPENT FUEL INSTRUMENTATION RELATED TO ORDERS EA-12-049 AND EA-12-051 (TAC NOS. MF0984, MF0985, MF0990, AND MF0991)

Dear Mr. Nazar:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events" and Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation," (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12054A736 and ML12054A679, respectively). The orders require holders of operating reactor licenses and construction permits issued under Title 10 of the *Code of Federal Regulations* Part 50 to submit for review, Overall Integrated Plans (OIPs) including descriptions of how compliance with the requirements of Attachment 2 of each order will be achieved.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A020), Florida Power and Light Company (FPL, the licensee) submitted its OIP for St. Lucie Plant, Unit Nos. 1 and 2 (St. Lucie), in response to Order EA-12-049. By letters dated August 28, 2013, February 26, and August, 27, 2014 (ADAMS Accession Nos. ML13242A274, ML14064A192, and ML14253A184, respectively), the licensee submitted its first three six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-111, "Regulatory Audits" (ADAMS Accession No. ML082900195). This audit process led to the issuance of the St. Lucie interim staff evaluation (ISE) (ADAMS Accession No. ML14002A124) and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A026), the licensee submitted its OIP for St. Lucie in response to Order EA-12-051. By letter dated July 16, 2013 (ADAMS Accession No. ML13196A079), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 26, 2013, August 27, 2013, February 28, and August 27, 2014 (ADAMS Accession Nos. ML13219A838, ML13242A006, ML14064A193, and ML14253A185, respectively), the licensee submitted its RAI responses and first three six-month updates to the OIP.

The NRC staff's review to date led to the issuance of the St. Lucie ISE and RAI dated November 19, 2013 (ADAMS Accession No. ML13274A473). By letter dated March 26, 2014 (ADAMS Accession No. ML14083A620), the NRC notified all licensees and construction permit holders that the staff is conducting in-office and onsite audits of their responses to Order EA-12-051 in accordance with NRC NRR Office Instruction LIC-111, as discussed above.

The ongoing audits allow the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions. Additionally, the staff gains a better understanding of submitted and updated information, audit information provided on ePortals, and preliminary Overall Program Documents/Final Integrated Plans while identifying additional information necessary for the licensee to supplement its plan and staff potential concerns.

In support of the ongoing audit of the licensee's OIPs as supplemented, the NRC staff conducted an onsite audit at St. Lucie from November 17-21, 2014 per the audit plan dated October 16, 2014 (ADAMS Accession No. ML14288A163). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and 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. The onsite activities included detailed analysis and calculation discussion, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

The enclosed audit report provides a summary of the activities for the onsite audit portion. Additionally, this report contains an attachment listing all open audit items currently under NRC staff review.

If you have any questions, please contact me at 301-415-5888 or by e-mail at Jason.Paige@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to be 'JP', with a long horizontal line extending to the right.

Jason Paige, Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos.: 50-335 and 50-389

Enclosure:
Audit report

cc w/encl: Distribution via Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

AUDIT REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO ORDERS EA-12-049 AND EA-12-051 MODIFYING LICENSES
WITH REGARD TO REQUIREMENTS FOR
MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS
AND RELIABLE SPENT FUEL POOL INSTRUMENTATION
FLORIDA POWER AND LIGHT
ST. LUCIE PLANT, UNITS 1 AND 2
DOCKET NOS. 50-335 AND 50-389

BACKGROUND AND AUDIT BASIS

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events" and Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation," (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12054A736 and ML12054A679, respectively). Order EA-12-049 directs licensees to develop, implement, and maintain 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 (BDBEE). Order EA-12-051 requires, in part, that all operating reactor sites have a reliable means of remotely monitoring wide-range SFP levels to support effective prioritization of event mitigation and recovery actions in the event of a BDBEE. The orders require holders of operating reactor licenses and construction permits issued under Title 10 of the *Code of Federal Regulations* Part 50 to submit for review, Overall Integrated Plans (OIPs) including descriptions of how compliance with the requirements of Attachment 2 of each order will be achieved.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A020), Florida Power and Light (FPL, the licensee) submitted its OIP for St. Lucie Plant, Units 1 and 2 (St. Lucie), in response to Order EA-12-049. By letters dated August 28, 2013, February 26, and August, 27, 2014 (ADAMS Accession Nos. ML13242A274, ML14064A192, and ML14253A184, respectively), the licensee submitted its first three six-month updates to the OIP. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049 in accordance with NRC Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-

Enclosure

111, "Regulatory Audits" (ADAMS Accession No. ML082900195). The purpose of the staff's audit is to determine the extent to which the licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the order. This audit process led to the issuance of the St. Lucie interim staff evaluation (ISE)(ADAMS Accession No. ML14002A124) and continues with in-office and onsite portions of this audit.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A026), the licensee submitted its OIP for St. Lucie in response to Order EA-12-051. By letter dated July 16, 2013 (ADAMS Accession No. ML13196A079), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 26, 2013, August 27, 2013, February 28, and August 27, 2014 (ADAMS Accession Nos. ML13219A838, ML13242A006, ML14064A193, and ML14253A185, respectively), the licensee submitted its RAI responses and first three six-month updates to the OIP. The NRC staff's review to date led to the issuance of the St. Lucie ISE and RAI dated November 19, 2013 (ADAMS Accession No. ML13274A473). By letter dated March 26, 2014 (ADAMS Accession No. ML14083A620), the NRC notified all licensees and construction permit holders that the staff is conducting in-office and onsite audits of their responses to Order EA-12-051 in accordance with NRC NRR Office Instruction LIC-111, as discussed above.

The ongoing audits allow the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions (AQs). Additionally, the staff gains a better understanding of submitted and updated information, audit information provided on ePortals, and preliminary Overall Program Documents (OPDs)/Final Integrated Plans (FIPs) while identifying additional information necessary for the licensee to supplement its plan and address staff potential concerns.

In support of the ongoing audit of the licensee's OIPs as supplemented, the NRC staff conducted an onsite audit at St. Lucie from November 17-21, 2014 per the audit plan dated October 16, 2014 (ADAMS Accession No. ML14288A163). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and 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. The onsite activities included detailed analysis and calculation discussion, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

Following the licensee's declarations of order compliance, the NRC staff will evaluate the OIPs as supplemented, the resulting site-specific OPDs/FIPs, and, as appropriate, other licensee submittals based on the requirements in the orders. For Order EA-12-049, the staff will make a safety determination regarding order compliance using the Nuclear Energy Institute (NEI) guidance document NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" issued in August, 2012 (ADAMS Accession No. ML12242A378), as endorsed by NRC interim staff guidance (ISG) 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'" (ADAMS Accession No. ML12229A174) as providing one acceptable means of meeting the order requirements. For Order EA-12-051, the staff will make a safety determination regarding order compliance using the NEI guidance document NEI 12-02,

Revision 1, "Industry Guidance for Compliance with NRC Order EA-12-051, 'To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation'" (ADAMS Accession No. ML12240A307), as endorsed, with exceptions and clarifications, by NRC JLD-ISG-2012-03 "Compliance with Order EA-12-051, 'Reliable Spent Fuel Pool Instrumentation'" (ADAMS Accession No. ML12221A339) as providing one acceptable means of meeting the order requirements. Should the licensee propose an alternative strategy or other method deviating from the guidance, additional staff review will be required to evaluate if the alternative strategy complies with the applicable order.

AUDIT ACTIVITIES

The onsite audit was conducted at the St. Lucie facility from November 17, 2014, through November 21, 2014. The NRC audit team staff was as follows:

Title	Team Member
Team Lead/Project Manager	Jason Paige
Technical Support	Garry Armstrong
Technical Support	Matthew McConnell
Technical Support	Stephen Wyman
Technical Support	Reed Anzalone

The NRC staff executed the onsite portion of the audit per the three part approach discussed in the October 16, 2014, plan, to include conducting a tabletop discussion of the site's integrated mitigating strategies compliance program, a review of specific technical review items, and discussion of specific program topics. Activities that were planned to support the above included detailed analysis and calculation discussions, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

AUDIT SUMMARY

1.0 Entrance Meeting (November 17, 2014)

At the audit entrance meeting, the NRC staff audit team introduced itself followed by introductions from the licensee's staff. The NRC audit team provided a brief overview of the audit's objectives and anticipated schedule.

2.0 Integrated Mitigating Strategies Compliance Program Overview

Per the audit plan and as an introduction to the site's program, the licensee provided a presentation to the NRC audit team titled "St. Lucie Nuclear Plant Mitigating Strategies for Beyond Design Basis External Events." The licensee provided an overview of its strategy to maintain core cooling, containment, and SFP cooling in the event of a BDBEE, and the plant modifications being done in order to implement the strategies. Also presented was the design and location of the FLEX equipment storage facility, the FLEX equipment that would be stored there, the interface with the Regional Response Center, and the spent fuel pool level indication modification.

3.0 Onsite Audit Technical Discussion Topics

Based on the audit plan, and with a particular emphasis on the Part 2 “Specific Technical Review Items,” the NRC staff technical reviewers conducted interviews with licensee technical staff, site walk-downs, and detailed document review for the items listed in the plan. Results of these technical reviews that require additional information from the licensee or still under NRC review are documented in the audit item status tables in Attachments 3 and 4, as discussed in the Conclusion section below.

3.1 Reactor Systems Technical Discussions and Walk-Downs

The staff reviewed St. Lucie’s modeling of an extended loss of alternating current power (ELAP) event and its ability to mitigate the event, including the computer code Combustion Engineering Nuclear Transient (CENTS) used for the ELAP analysis and input parameters assumed to generate the results of the analysis (i.e., the reactor coolant pump seal leakage, reactor coolant system (RCS) venting, etc.). For example, the NRC staff met with licensee staff to discuss the timing of the injection of borated water into the RCS, and the mixing of that water during natural circulation conditions.

3.2 Electrical Technical Discussions and Walk-Downs

The staff walked down panels used for load shedding to evaluate feasibility and timing. In addition, the staff reviewed the calculations on extending battery life based on load shedding, and walked down the turbine-driven auxiliary feedwater (TDAFW) Pump to evaluate strategies for hydrogen and temperature control. The staff noted that the TDAFW pump room is installed in an outdoor environment. The TDAFW pumps are installed in an outdoor environment within the qualified steam trestle and the pumps bearings do not rely on external cooling systems (i.e., cooling of the lube oil for the pump is not dependent on AC power). Direct current (DC) powered active valves that admit steam to and pass flow from the TDAFW pumps are qualified to operate under design outdoor environmental conditions. Thus, the TDAFWP do not require ventilation to maintain an environment that allows them to achieve the position relied upon for FLEX strategies.

3.3 SFPI Technical Discussions and Walk-Downs

NRC staff walked down the SFP area, SFPI locations, and related equipment mounting areas. No concerns were identified during the walk-downs.

3.4 Other Technical Discussion Areas and Walk-Downs

- a. In review of ISE CIs 3.2.1.1.A and 3.2.1.2.A, ELAP analysis, the staff confirmed that both units will be aligned to provide make-up in advance of 18 hours, which is St. Lucie’s limiting time to provide make-up. The licensee’s updated sequence of events (SOE) indicates that charging pumps will be repowered and able to provide makeup at 9 hours. This SOE is based directly on the WCAP-17601-P CENTS analysis, which assumes 15 gpm/pump of seal leakage. The staff considers the licensee’s leakage rate very

conservative compared to the 1.5 gpm/pump of leakage provided to the NRC by Flowserve.

- b. In review of ISE CI 3.2.4.7.A, water inventory, the staff reviewed the licensee's list of condensate storage tank (CST) and refueling water tank (RWT) makeup sources. The Unit 2 CST is protected from all hazards, but the Unit 1 CST is only partially protected from tornado missile hazards. The licensee indicated that the additional water sources will comprise of demineralized water sources, borated water, potable water, and ultimately the ultimate heat sink for steam generator (SG) makeup through the TDAFW pumps. Specifically, the licensee provided documentation of the water capacity and prioritization of the quality of water to be used for the following sources for CST makeup: treated water, primary water, refueling water, city water, retention pond, and intake canal. The staff observed the location of the secondary water sources and their proposed connection points during a walkdown. The staff reviewed the documentation for secondary water sources and found that the licensee has adequately addressed CST makeup following high wind missile events. No makeup to the RWT is needed for Phase 2 since the borated water source is the protected safety injection tank (SIT).
- c. In review of flooding (AQ 2), the licensee identified during the site audit that the emergency core cooling system (ECCS) pump rooms are at the lowest reactor auxiliary building (RAB) elevation and can receive drainage water from higher elevations. The licensee has mitigating actions in place by keeping the watertight doors intact and operator actions to isolate drains to the rooms. These actions can take place without using AC power. Also, the licensee indicated that AC power is not required to mitigate ground water flooding since dewatering or extraction pumps are not needed due to the building entrances being above the plant probable maximum flood (PMF) high water elevation. The licensee did highlight that standing water due to local intense precipitation near the outside of seismic Category 1 building entrances could potentially occur for short durations. The licensee is currently evaluating those instances as part of its corrective action program. The staff reviewed the licensee's internal flooding criteria as confirmation of its evaluation. The staff finds that the licensee's assessment of internal flooding sources is adequate for ELAP conditions.
- d. In review of battery room ventilation (AQ 44), the licensee noted that the design basis battery room roof exhausters will be powered from the FLEX 480V diesel generator (DG) when the battery room chargers are placed in operation to provide ventilation consistent with that provided during normal operation. During normal operations, the RAB HVAC system is designed to limit the maximum inside air temperature below 104°F. The only heat load in the room is due to lighting following a loss of all AC power. The maximum battery temperature is based on a cell charging temperature limit of 120°F. There is a very gradual reduction in the room temperature following a loss of all AC power event (less than 1°F) due to losses through the boundary. The minimum site design temperature is 32°F resulting from the subtropical location of St. Lucie, which precludes any extreme low temperature effects from a BDBEE for external hazards. The battery room roof exhausters RV-1 and RV-2 will be repowered at or before the time battery room chargers are placed in service to prevent hydrogen accumulation. The battery room roof exhausters will also assist ventilation needs.

- e. In review of uncontrolled cooldown (AQ 49), the licensee indicated during the site audit that the atmospheric dump valves (ADVs) are safety-related and are located within the steam trestle, which is a safety-related structure qualified to withstand tornado missiles. By being enclosed within the steam trestle, the ADVs and associated piping upstream is also protected from tornado missiles. The staff observed the location of the ADVs during a walk down with the licensee and confirmed that tornado missiles could not impact the operation of the ADVs. Due to the ADVs being protected from tornado missiles, the staff finds that the licensee has adequately addressed the staff's concern with an uncontrolled cooldown due to the ADVs being impacted by a tornado.
- f. In review of SE Review Item 6 the refueling strategy, the staff discussed with the licensee St. Lucie's overall refueling strategy for FLEX equipment. The licensee provided procedures that described the refueling strategy for FLEX equipment and the fuel oil transfer process between the diesel oil storage tanks. The refueling strategy procedure provided fuel consumption rates for all of the FLEX equipment to be used for an ELAP. The existing oil storage tanks can provide up to 15 days of fuel oil. The licensee also provided a drawing which provided the primary and alternate connections for transferring fuel. As far as fuel quality for the FLEX equipment, the licensee provided documentation explaining how the fuel quality testing would be conducted throughout the site. In addition, the licensee mentioned that for Phase 3, fuel trucks are contracted to arrive on site to replenish fuel oil. The staff has reviewed all of the above documents for the refueling strategy and finds that the strategy is adequate for ELAP.
- g. In review and walking down the FLEX equipment storage buildings, the staff noted that St. Lucie's FLEX storage configuration consists of two storage buildings. One building will store N sets of FLEX equipment (N-building) and the second building (+1-building) will contain the additional +1, set of FLEX equipment. The N-building is hardened against all BDBEEs and the +1-building is hardened against all BDBEEs except for tornado winds/missiles.

After the conclusion of the onsite audit, the NRC staff identified that the St. Lucie N-building / +1-building FLEX equipment storage configuration is not consistent with the tornado wind/missile hazard reasonable protection configurations described in the NEI guidance contained in Section 7.3.1 of NEI 12-06. Section 7.3.1.1.a describes a configuration where FLEX equipment is reasonably protected in a structure designed to withstand the tornado wind/missile hazard. The +1 building is not hardened against tornado hazards and, therefore, does not meet the guidance contained in NEI 12-06, Section 7.3.1.1.a.

NEI 12-06, Sections 7.3.1.1.b and 7.3.1.1.c describe configurations where FLEX equipment is reasonably protected against tornado hazards by an adequate separation distance and orientation. The NRC position is that configuration 7.3.1.1.b and 7.3.1.1.c require N sets of equipment to be stored in each diverse location for a FLEX storage configuration that consists of only 2 locations. While the N-building and +1-building are separated, only one of the locations contains the full N set of FLEX equipment and, therefore, does not meet the guidance contained in NEI 12-06, Section 7.3.1.1.b or 7.3.1.1.c.

NEI 12-06, Section 11.3.3 states the following:

FLEX mitigation equipment should be stored in a location or locations informed by evaluations performed per Sections 5 through 9 such that no one external event can reasonably fail the site FLEX capability (N).

NEI Section 10.1, "Aggregation of FLEX Strategies," includes the following:

Provision of at least N+1 sets of portable on-site equipment stored in diverse locations or in structures designed to reasonably protect from applicable BDBEEs is essential to provide reasonable assurance that N sets of FLEX equipment will remain deployable to assure success of the FLEX strategies.

Per the guidance above, it is essential to reasonably protect at least N+1 sets of FLEX equipment from all applicable BDBEEs to reasonably assure that N sets (FLEX capability, per section 11.3.3) will remain deployable after the BDBEE. When the reasonable protection scheme of either Section 7.3.1.1.b or 7.3.1.1.c is utilized, 2 sets of N FLEX equipment must be located in the separate locations. The St. Lucie FLEX equipment storage configuration does not meet the reasonable protection schemes of Section 7.3.1.1.b or 7.3.1.1.c since N sets of FLEX equipment are not contained in both locations. Also, as noted above, the St. Lucie FLEX equipment storage configuration does not meet the reasonable protection scheme of Section 7.3.1.1.a since only N sets of FLEX equipment are stored in a robust structure that protects against all BDBEEs. Therefore, the St. Lucie FLEX equipment storage configuration does not meet the guidance contained in NEI 12-06, Section 10.1, in that it only affords reasonable protection from all applicable BDBEEs for N sets of FLEX equipment, not N+1 sets, as stipulated in the NEI guidance as described above.

The NRC staff further identified that the St. Lucie FLEX storage configuration would not support the maintenance and testing provisions contained in Section 11.5.3 of NEI 12-06. Specifically, section 11.5.3.b states:

Portable equipment may be unavailable for 90 days provided that the site FLEX capability (N) is available.

Should an item of FLEX equipment be made unavailable in the N-building, the site FLEX capability (N) would no longer be available to mitigate a tornado related BDBEE. The corresponding +1 item of FLEX equipment is not considered to be reasonably protected against the tornado hazard, and therefore, is not reasonably assured to be available or remain deployable to assure success of the FLEX strategies. The remaining available and deployable FLEX equipment, reasonably protected in the N-building, would be less than the site FLEX capability (N). Therefore, the St. Lucie FLEX equipment storage configuration would not meet the condition included in NEI 12-06, Section 11.5.3.b (site Flex capability (N) is available) stipulated for the allowance of the 90-day portable equipment unavailability.

In summary, the NRC staff considers the St. Lucie FLEX storage configuration not being consistent with guidance contained in NEI 12-06. Further consideration of the St. Lucie FLEX storage configuration by the NRC staff would require that the licensee propose the configuration as an alternative to the guidance of NEI 12-06, accompanied with appropriate justification. This item is being tracked under SE Review Item 8 (see Attachment 3).

4.0 Exit Meeting (November 21, 2014)

The NRC staff audit team conducted an exit meeting with licensee staff following the closure of onsite audit activities. The NRC staff highlighted items reviewed and noted that the results of the onsite audit trip will be documented in this report. The following items that require additional information from the licensee or still under NRC review were discussed at the exit meeting (see Attachments 3 and 4 for additional information):

a. ISE CI 3.2.1.8.B, RCS Inventory

The staff noted that the licensee's strategy to cooldown and depressurize at St. Lucie is to enable the SITs to act as the primary means of RCS makeup. The charging pump is not an "alternate" strategy to the SITs, and is eventually required before long-term cooldown to prevent the SITs from injecting nitrogen into the RCS once the tanks are depleted and to maintain shutdown margin (SDM). The licensee indicated that this approach meets NEI 12-06 guidance because all of the equipment is designed to meet Class 1E requirements and is located in a protected structure.

The licensee indicated that makeup needed for boration prior to Mode 5 cooldown and depressurization will be provided by repowering one of two positive displacement charging pumps, which can draw from either the boric acid makeup tank, which is protected, or the RWT, and can inject into either the normal charging path or the high pressure safety injection (HPSI) header. The discharge header of the HPSI pumps serves as a common point in these flow paths, though one side can be isolated from the other. At this time, the staff has no additional questions and is currently reviewing the information provided.

b. ISE CIs 3.2.4.2.A and 3.2.4.6.A, Heat-up Analysis

The licensee indicated that the electrical equipment room and control room heat-up analyses are being revised. The staff requested that the licensee provide the revised analyses on the ePortal for review.

c. ISE CI 3.2.4.10.A, Battery Load Shed

The revised battery load shed strategy is to initially secure one battery, load shed and operate on the other battery, and return the secured battery to service before the first battery is depleted, thereby extending the available coping time. The staff requested that the licensee provide a revised procedure that shows when they plan to swap batteries and/or how they will determine when to swap batteries (i.e., periodically monitor voltage).

d. AQ 14, SFP Ventilation

The staff discussed with the licensee its ventilation strategy to vent steam and condensate coming off the SFP. The licensee indicated that the floor elevation surrounding the SFP is at elevation 62 ft. The L-shaped door (400 SF) penetrates the wall and roof at elevation 96.8 ft. At the south end of the SFP area is a 6 ft x 30 ft doorway which allows for air circulation through the SFP area and out the L-shaped opening. The licensee has determined that actions to open the L-shaped door and to layout hoses on the 62 ft elevation must be completed in a nominal 2 hour timeframe. The staff requested that the licensee provide an evaluation justifying the required time frame or identify an alternate venting approach.

e. AQ 42, SG FLEX Pump Time Validation

The licensee described the portable diesel driven pump (SG FLEX pump) being deployed for injection into the SGs in the event that the TDAFW pump fails. The licensee indicated that the time and resources to make connections of the SG FLEX pump will be validated. During the onsite audit, the licensee indicated that the time and resource validation has not been completed for the SG FLEX pump deployment and connection. The staff requested that the licensee provide the time and resource validation on the ePortal once it's completed.

f. Licensee Identified Open Item 25, WCAP-17601-P Deviations

The licensee identified an action to include in its six-month updates the technical basis for any WCAP-1760 1-P deviations. The staff indicated that this item is being left as an open item, since the staff's review is ongoing and the licensee's strategy may change.

g. SE Review Item 1, RCS Venting

The NRC staff reviewed the SDM calculations provided by the licensee, which indicated that SDM will be maintained through Phases 1 and 2 via SIT injection of borated water. This strategy was found to be generally acceptable, but the secondary pressure in the initial cooldown that enables SIT injection is sufficiently low that there is the potential for nitrogen injection into the RCS. The SDM calculation also indicated that additional boron is required to maintain SDM in the cooldown to Mode 5 that occurs in Phase 3. This boron will be added to the primary system by the charging pumps, which may require letdown of liquid water from the RCS. The licensee indicated that venting and letdown will be accomplished through the use of the head vents (the reactor coolant gas vent system or RCGVS), but these vents are only capable of passing the liquid flow rate required for continuous charging pump operation at a primary system pressure of 750 psia. This repressurization is undesirable and may cause damage to the RCS. In reviewing the procedures provided by the licensee, the staff found that the operators may allow the SITs to inject nitrogen into the primary system in the initial cooldown and fail to account for the potential of a water-solid primary system. The NRC staff therefore requested the licensee to update the procedures to (a) avoid injection of nitrogen into the RCS and (b) avoid repressurization of the RCS through the use of charging pumps. The NRC staff also requested updated SDM calculations that align with the updated operating procedures, to provide assurance that sufficient SDM will remain available in the cooldown to Mode 5.

CONCLUSION

The NRC staff completed all three parts of the October 16, 2014, onsite audit plan. Each audit item listed in Part 2 of the plan was reviewed by NRC staff members while on site. In addition to the list of NRC and licensee onsite audit staff participants in Attachment 1, Attachment 2 provides a list of documents reviewed during the onsite audit portion.

In support of the continuing audit process as the licensee proceeds towards orders compliance for this site, Attachments 3 and 4 provide the status of all open audit review items that the NRC staff is evaluating in anticipation of issuance of a combined safety evaluation for both the Mitigation Strategies and Spent Fuel Pool Level Instrumentation orders. The five sources for the audit items referenced below are as follows:

- a. Interim Staff Evaluation (ISE) Open Items (OIs) and Confirmatory Items (CIs)
- b. Audit Questions (AQs)
- c. Licensee-identified Overall Integrated Plan (OIP) Open Items (OIs)
- d. Spent Fuel Pool Level Instrumentation (SFPLI) Requests for Additional Information (RAIs)
- e. Additional Safety Evaluation (SE) needed information

The attachments provide audit information as follows:

- a. Attachment 1: List of NRC staff and licensee staff audit participants
- b. Attachment 2: List of documents reviewed during the onsite audit
- c. Attachment 3: St. Lucie MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input as delineated
- d. Attachment 4: St. Lucie MS/SFPI SE Audit Items currently under NRC staff review but not requiring further licensee input

While this report notes the completion of the onsite portion of the audit per the audit plan dated October 16, 2014, the ongoing audit process continues as per the letters dated August 28, 2013, and March 26, 2014, to all licensees and construction permit holders for both orders.

Additionally, while Attachments 3 and 4 provide a progress snapshot of the NRC staff's review of the licensee's OIPs, as supplemented, and as augmented in the audit process, the status and progress of the NRC staff's review may change based on licensee plan changes, resolution of generic issues, and other NRC staff concerns not previously documented. Changes in the NRC staff review will be communicated in the ongoing audit process.

Lastly, the licensee has identified open items that need to be completed to implement orders EA-12-049 and EA-12-051, and the staff expects that the licensee continue to provide updates on the status of the licensee identified open items in their 6-month updates or on the ePortal.

Attachments:

1. NRC and Licensee Staff Onsite Audit Participants
2. Onsite Audit Documents Reviewed
3. St. Lucie MS/SFPI SE Audit Items currently under NRC staff review and requiring licensee input
4. St. Lucie MS/SFPI SE Audit Items currently under NRC staff review but not requiring further licensee input

Onsite Audit Participants

NRC Staff:

Jason Paige	NRR/JLD/JOMB
Reed Anazalone	NRR/JLD/JERB
Matthew McConnell	NRR/JLD/JERB

Stephen Wyman	NRR/JLD/JERB
Garry Armstrong	NRR/JLD/JCBB

St. Lucie Staff:

Jeff McCullough	Security
Charles Workman	Security
Mike Bladek	Program Manager
John Berlett	Security
Spike English	Projects
Dale Shepherd	Fleet Regulatory Technical Support
Joe Jensen	Site Vice President
Bob Coffey	Plant Manager
Ken Frehafer	Licensing
William Cross	Licensing
Ronnie Lingle	Fukushima Fleet Lead
Liz Abbott	Director of Fleet Regulatory Affairs
Dan West	St. Lucie Fukushima Lead
Eric Katzman	Licensing Manager
Frank Baker	St. Lucie Emergency Preparedness
Rick Virgin	St. Lucie Training
Andrew Brady	Security
M. Jones	Engineering

Documents Reviewed

- Action 1017, St. Lucie Boration for Shutdown Margin, Rev. 0
- Westinghouse Letter LTR-FSE-13-46, Rev. 0-A (DRAFT), Westinghouse Response to NRC Generic Request for Additional Information (RAI) on Boron Mixing in Support of the Pressurized Water Reactor Owner's Group, June 11, 2013
- January 8, 2014 NRC letter endorsing W position paper
- Westinghouse Letter LTR-TDA-13-20-P, Rev 0 – CENTS white paper
- PSL-1FJF-13-110, "St. Lucie Unit 1 Extended Station Blackout Boron Requirements"
- PSL-1FJF-13-076, "St. Lucie Unit 2 Extended Station Blackout Boron Requirements"
- Revised SOE that accounts for 2-6hr cooldown
- FSG-01
- FSG-08
- FSG-09
- Westinghouse LTR-TDA-13-20-P, Rev. 0
- FPL-064-CALC-011, Rev. 2
- DBD-AFW-1 Rev. 4, Auxiliary Feedwater System
- DBD-AFW-2 Rev. 5, Auxiliary Feedwater System
- FPL064-CALC-007, Rev. 1, Electrical Equipment Rooms: 1A, 1B, 1C Heat Up During an Extended Loss of Off-site Power
- PSL-1FJM-92-030 Rev. 3, St. Lucie Unit 1 Electrical Heat Loads and Steel Mass Input for Use in Station Blackout Temperature Evaluation of the Control Room
- NAI-1474-002, Rev. 1, Station Blackout Control Room and Reactor Auxiliary Building Area Temperature
- FPL064-CALC-008, Rev. 0, Control Room Heatup During an Extended Loss of AC Power
- FPL064-CALC-004 Rev. 1, Final Calculation – Suggested Load Shedding for Extension of Station Service Batteries 1A, 1B Discharge Capacity during Extended Loss of AC Power (FLEX Conditions)
- FPL064-CALC-005 Rev. 1, Final Calculation – Suggested Load Shedding for Extension of Station Service Batteries 2A, 2B Discharge Capacity during Extended Loss of AC Power (FLEX Conditions)
- 1-FSG-04 – Rev. 0, ELAP DC Bus Load Shed and Management-Unit 1
- 2-FSG-04 – Rev. 0, ELAP DC Bus Load Shed and Management-Unit 2
- 1-FSG-99 – Rev. 0, Appendices/Figures/Tables/Data Sheets
- 1-FSG-99 – Appendix B, ELAP DC Load Management Calculation PSL-1-F-J-E-90-0013, "St. Lucie Unit 1 Emergency Diesel Generator 1A and 1B Electrical Loads," Rev. 7 (EC 279083)
- 1-FSG-05, Initial Assessment and FLEX Equipment Staging
- 1-FSG-99 Appendix D, 480 V Electrical AC Bus Preparations – Phase 2
- 1-FSG-99 Appendix C, Electrical Bus Preparation – Phase 3
- 1-FSG-99 Appendix E, Staging, Installation and Operation of the FLEX 480 V Diesel Generator
- 1-FSG-99 Appendix R, Staging, Installation and Operation of the FLEX 4160 V DG

- EC280519-E-002 Rev. 1
- Westinghouse document CN-PEUS-13-28 Rev. 2
- STD-C-004 Rev. 0, Seismic Response Spectra - St. Lucie Units 1 & 2
- Calculation NAI-1784-003 Rev. 0
- Drawing 2998-G-125 SH DO-AC-1
- Calculation FPL064-002

**St. Lucie
Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:**

Audit Items Currently Under NRC Staff Review and Requiring Licensee Input

Audit Item Reference	Item Description	Licensee Input Needed
ISE CI 3.2.4.2.A ISE CI 3.2.4.6.A	Heat-up Analyses	The licensee indicated that the electrical equipment room and control room heat-up analyses are being revised. The staff requests that the licensee provide the revised analyses on the ePortal for review.
ISE CI 3.2.4.10.A	Battery Load Shed	The revised battery load shed strategy is to initially secure one battery, load shed and operate on the other battery, and return the secured battery to service before the first battery is depleted, thereby extending the available coping time. The staff requests that the licensee provide a revised procedure that shows when they plan to swap batteries and/or how they will determine when to swap batteries (i.e., periodically monitor voltage).
AQ 14	SFP Ventilation	The staff requests that the licensee provide an evaluation justifying the required time frame to vent steam and condensate coming off the SFP or identify an alternate venting approach.
AQ 42	SG FLEX Pump Time Validation	The licensee described the portable diesel driven pump (SG FLEX pump) being deployed for injection into the SGs in the event that the TDAFW pump fails. The licensee indicated that the time and resources to make connections of the SG FLEX pump will be validated. The staff requests that the licensee provide the time and resource validation on the ePortal once it's completed.

Audit Item Reference	Item Description	Licensee Input Needed
Licensee Identified Open Item 25	WCAP-17601-P Deviations	The licensee identified an action to include in its six-month updates the technical basis for any WCAP-1760 1-P deviations. The staff indicated that this item is being left as an open item, since the staff's review is ongoing and the licensee's strategy may change.
SE Review Item 1	RCS Venting	The NRC staff requests that the licensee provide updated cooldown procedures to (a) avoid injection of nitrogen into the RCS and (b) avoid repressurization of the RCS through the use of charging pumps. The NRC staff also requests that the licensee provide updated SDM calculations that align with the updated operating procedures, to provide assurance that sufficient SDM will remain available in the cooldown to Mode 5.
SE Review Item 8	FLEX Equipment Storage Buildings	The NRC staff considers the St. Lucie FLEX storage configuration not being consistent with guidance contained in NEI 12-06. The staff requests that the licensee propose the configuration as an alternative to the guidance of NEI 12-06, accompanied with appropriate justification.

**St. Lucie
Mitigation Strategies/Spent Fuel Pool Instrumentation Safety Evaluation Audit Items:**

Audit Items Currently Under NRC Staff Review But Not Requiring Further Licensee Input

Audit Item Reference	Item Description	Action
ISE CI 3.2.1.8.B	RCS Inventory	The licensee indicated that makeup needed for boration prior to Mode 5 cooldown and depressurization will be provided by repowering one of two positive displacement charging pumps, which can draw from either the boric acid makeup tank or the RWT, and can inject into either the normal charging path or the high pressure safety injection (HPSI) header. The discharge header of the HPSI pumps serves as a common point in these flow paths, though one side can be isolated from the other. At this time, the staff has no additional questions and is currently reviewing the information provided.
AQ 43	Containment Analysis	The staff is currently reviewing the licensee's containment analysis FPL-CALC-003, "MAAP Containment Analysis."

The NRC staff's review to date led to the issuance of the St. Lucie ISE and RAI dated November 19, 2013 (ADAMS Accession No. ML13274A473). By letter dated March 26, 2014 (ADAMS Accession No. ML14083A620), the NRC notified all licensees and construction permit holders that the staff is conducting in-office and onsite audits of their responses to Order EA-12-051 in accordance with NRC NRR Office Instruction LIC-111, as discussed above.

The ongoing audits allow the staff to review open and confirmatory items from the mitigation strategies ISE, RAI responses from the spent fuel pool instrumentation (SFPI) ISE, the licensee's integrated plans, and other audit questions. Additionally, the staff gains a better understanding of submitted and updated information, audit information provided on ePortals, and preliminary Overall Program Documents/Final Integrated Plans while identifying additional information necessary for the licensee to supplement its plan and staff potential concerns.

In support of the ongoing audit of the licensee's OIPs as supplemented, the NRC staff conducted an onsite audit at St. Lucie from November 17-21, 2014 per the audit plan dated October 16, 2014 (ADAMS Accession No. ML14288A163). The purpose of the onsite portion of the audit was to provide the NRC staff the opportunity to continue the audit review and 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. The onsite activities included detailed analysis and calculation discussion, walk-throughs of strategies and equipment laydown, visualization of portable equipment storage and deployment, staging and deployment of offsite equipment, and physical sizing and placement of SFPI equipment.

The enclosed audit report provides a summary of the activities for the onsite audit portion. Additionally, this report contains an attachment listing all open audit items currently under NRC staff review.

If you have any questions, please contact me at 301-415-5888 or by e-mail at Jason.paige@nrc.gov.

Sincerely,
/RA/
 Jason Paige, Project Manager
 Orders Management Branch
 Japan Lessons-Learned Division
 Office of Nuclear Reactor Regulation

Docket Nos.: 50-335 and 50-389
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DATE	02/25/15	02/26/15	02/27/15	

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