



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

September 1, 2015

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNITS 1 AND 2 - 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 (TAC NOS. MF0942, MF0943, MF0944, AND MF0945)

Dear Sir/Madam:

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. ML13063A151), Entergy Operations, Inc. (Entergy, the licensee), submitted its OIP for Arkansas Nuclear One, Units 1 and 2 (ANO), in response to Order EA-12-049. By letters dated August 28, 2013, February 27, 2014, August 28, 2014, and February 24, 2015 (ADAMS Accession Nos. ML13241A414, ML14059A229, ML14241A660, and ML15056A137, respectively), Entergy submitted its first four 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 ANO interim staff evaluation (ISE) (ADAMS Accession No. ML14007A459) and continues with in-office and onsite portions of this audit. By letter dated May 28, 2014 (ADAMS Accession No. ML14140A514), the NRC staff provided Entergy with an update to the Order EA-12-049 audit activities at ANO.

By letter dated February 28, 2013 (ADAMS Accession No. ML13063A015), the licensee submitted its OIP for ANO, in response to Order EA-12-051. By letter dated June 26, 2013, (ADAMS Accession No. ML13156A313), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 25, 2013, August 28, 2013, February 27, 2014, August 28, 2014 and February 24, 2015 (ADAMS Accession Nos. ML13207A269, ML13241A415, ML14059A230, ML14246A209, and ML15056A153, respectively), the licensee submitted its RAI responses and first four six-month updates to the OIP. The NRC staff's

review to date led to the issuance of the ANO ISE and RAI dated October 29, 2013 (ADAMS Accession No. ML13281A502). 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 e-portals, 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 ANO from April 20 – 23, 2015, per the audit plan dated March 9, 2015 (ADAMS Accession No. ML15054A320). 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 301-415-2833 or by e-mail at Peter.Bamford@nrc.gov.

Sincerely,

A handwritten signature in black ink that reads "Peter Bamford". The signature is fluid and cursive, with the first name "Peter" and last name "Bamford" clearly distinguishable.

Peter Bamford, Senior Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos. 50-313 and 50-368

Enclosure:
Audit report

cc w/encl: Distribution via Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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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
ENTERGY OPERATIONS, INC.
ARKANSAS NUCLEAR ONE, UNITS 1 AND 2
DOCKET NOS. 50-313 AND 50-368

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. ML13063A151), Entergy Operations, Inc. (Entergy, the licensee), submitted its OIP for Arkansas Nuclear One, Units 1 and 2 (ANO), in response to Order EA-12-049. By letters dated August 28, 2013, February 27, 2014, August 28, 2014, and February 24, 2015 (ADAMS Accession Nos. ML13241A414, ML14059A229, ML14241A660, and ML15056A137, respectively), Entergy submitted its first four 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

Enclosure

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By letter dated February 28, 2013 (ADAMS Accession No. ML13063A015), the licensee submitted its OIP for ANO, in response to Order EA-12-051. By letter dated June 26, 2013, (ADAMS Accession No. ML13156A313), the NRC staff sent a request for additional information (RAI) to the licensee. By letters dated July 25, 2013, August 28, 2013, February 27, 2014, August 28, 2014 and February 24, 2015 (ADAMS Accession Nos. ML13207A269, ML13241A415, ML14059A230, ML14246A209, and ML15056A153, respectively), the licensee submitted its RAI responses and first four six-month updates to the OIP. The NRC staff's review to date led to the issuance of the ANO ISE and RAI dated October 29, 2013 (ADAMS Accession No. ML13281A502). 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 e-portals, and preliminary Overall Program Documents (OPDs) /Final Integrated Plans (FIPs) 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 ANO from April 20 – 23, 2015, per the audit plan dated March 9, 2015 (ADAMS Accession No. ML15054A320). 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 Japan Lessons-Learned Directorate (JLD) 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 ISG 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 ANO facility from April 20 – 23, 2015. The NRC audit team staff was as follows:

Title	Team Member
Team Lead/Project Manager	Peter Bamford
Technical Support	Joshua Miller
Technical Support	Matthew McConnell
Technical Support	Prem Sahay
Technical Support	Michael Levine
Technical Support	Khoi Nguyen

The NRC staff executed the onsite portion of the audit per the three part approach discussed in the March 9, 2015, 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 (April 20, 2015)

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 "Arkansas Nuclear One (ANO) ANO-1 and ANO-2, NRC FLEX and SFPI Audit April 20 – April 23, 2015." 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. The licensee also presented the location of the FLEX equipment storage facilities, the FLEX equipment that would be stored there, the interface with the National SAFER Response Center (NSRC), and information regarding communications,

procedures, and training. The presentation included an overview of the spent fuel pool level indication modifications.

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 reviews for the items listed in the plan. Results of these technical reviews that require additional information from the licensee or are 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 NRC staff met with licensee staff to discuss the amount of leakage from the reactor coolant pump (RCP) seals, reactor coolant system (RCS) makeup strategy, the availability of water sources, and the ability to remove heat from the reactor coolant system via the steam generators. The NRC staff reviewed the analysis and flow calculations along with applicable procedures. The NRC staff also walked down the licensee's strategies and reviewed plant procedures for implementing the core cooling and makeup strategies.

3.2 Electrical Technical Discussions and Walk-Downs

- a. The NRC staff reviewed the calculations and strategy regarding extending battery life based on load shedding, and walked down the battery rooms to evaluate strategies for hydrogen and temperature control. The NRC staff also walked down panels used for load shedding to evaluate feasibility and timing.
- b. The NRC staff walked down connection points and locations for FLEX electrical generators. In order to support the licensee's Phase 2 strategy, one 480V electrical generator will be deployed to supply both units. The licensee will have a second backup (N+1) generator available. The two generators will be stored (one each) in the two FLEX storage buildings being constructed on the ANO site. The staff reviewed the licensee's load and sizing calculations for the FLEX generators.

3.3 SFPI Technical Discussions and Walk-Downs

The NRC staff walked down the instrument, transmitter, electronics, and display locations for the SFP level instrumentation, along with the associated cable runs. No concerns were identified during the walkdown. The NRC staff also reviewed the associated calibration, maintenance and test procedures for the SFP level instrumentation.

3.4 Other Technical Discussion Areas and Walk-Downs

- a. The NRC staff toured the areas where the two FLEX storage buildings are located. The FLEX storage buildings are designed to survive all site hazards except tornado missiles and floods. The licensee located the two buildings with a separation distance designed to comply with the provisions of NEI 12-06. For a flood condition, only one building is located above the projected maximum flood level. Given the flood warning time, the equipment from the FLEX storage building located below the maximum flood level would be pre-staged on two platforms at the deployment locations. The NRC staff voiced a concern that the equipment stored in the building that is above the flood level could not be deployed to the site during the worst case flood persistence period due to inundated roadways. The licensee agreed to describe alternate provisions, including a corporate support capability, which could be employed to deploy this equipment if necessary. The NRC staff walked down equipment haul routes from the FLEX storage buildings to the designated deployment sites, and walked down haul routes from designated staging areas for equipment that will be delivered from the NSRC.
- b. The NRC staff walked down the FLEX strategies for core cooling, RCS inventory, and SFP inventory functions. This included the point of deployment for the portable FLEX pumps, hose routing and deployment connection points (primary and alternate, as identified to date).
- c. The NRC staff reviewed the strategy that will be implemented by the licensee to refuel the portable diesel-powered FLEX equipment. The NRC staff reviewed the instructions for refueling the equipment, as well as the equipment needed to perform the refueling. Additionally, the staff reviewed the licensee's procedures for ensuring adequate fuel quality.
- d. The licensee's cooldown strategy relies on operation of the steam generator atmospheric dump valves (ADV's) for each unit. The NRC staff reviewed the capability to operate the ADV's during an extended loss of alternating current power (ELAP).
- e. The NRC staff reviewed the licensee's plans to ensure adequate communications, lighting, personnel access, and equipment access, to successfully implement the strategies. The NRC staff interviewed plant personnel responsible for these areas, and observed lighting and communication features during plant walkdowns.

4.0 Exit Meeting (April 23, 2015)

The NRC staff audit team conducted pre-exit and exit meetings with licensee staff following the completion of the onsite review activities. The NRC staff highlighted items still under review and noted that the results of the onsite audit trip will be documented in this report. Items that require additional information from the licensee or are still under NRC review are detailed in Attachments 3 and 4 of this report.

CONCLUSION

The NRC staff completed all three parts of the March 9, 2015, 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 SE for both the mitigation strategies (MS) and SFPI orders. These attachments include items remaining from the onsite audit, as well as any items that are being reviewed exclusively in the NRC offices, or have been added since the onsite audit. The five sources for the audit items referenced below are as follows:

- a. MS ISE open Items (OIs) and confirmatory items (CIs)
- b. MS audit questions (AQs)
- c. Licensee-identified Overall Integrated Plan (OIP) Open Items
- d. SFPI RAls
- e. Additional safety evaluation (SE) needed information

While this report notes the completion of the onsite portion of the audit per the audit plan dated March 9, 2015, the ongoing audit process continues, as per 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.

Attachments:

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

Onsite Audit Participants

NRC Staff:

Peter Bamford	NRR/JLD/JOMB
Joshua Miller	NRR/JLD/JERB
Prem Sahay	NRR/JLD/JERB
Khoi Nguyen	NRR/JLD/JERB
Matthew McConnell	NRR/JLD/JERB
Michael Levine	NRR/JLD/JCBB

ANO Staff:

Natalie Mosher	Licensing Engineer
Robert Holeyfield	Project Manager
James Keys	Operations Shift Manager
Michael Harris	Operations Procedure Writer
RJ Wood	Chemistry Technician
Roger Freeman	EP Manager
Lawrence Webb	Radiation Protection Technician
Chris Brannan	Operations
Brian Adkison	Mechanical Design Engineer
Brian Ford	Senior Manager, Regulatory Affairs
Dan Jacobsen	Entergy Corporate Engineering
Eric Allen	Senior Engineer
Brad Miller	Electrical Design Engineer
Rodney Carter	Operations Specialist
Casey McCurrin	Enercon
Josh Thalheimer	Enercon

Documents Reviewed

FLEX Support Guidelines (FSGs) (C=Common, 1=Unit 1, 2=Unit 2)

1FSG-002, "Alternate EFW Suction Source," Change 0 (DRAFT)

2FSG-002, "Alternate EFW Suction Source," Change 0

1FSG-003, "Alternate Low Pressure Emergency Feedwater," Change 0

2FSG-003, "Alternate Low Pressure Emergency Feedwater," Change 0

1FSG-004, "ELAP DC Bus Load Shed and Management," Change 0

2FSG-004, "ELAP DC Bus Load Shed and Management," Change 0

CFSG-005, "Initial Assessment and FLEX Equipment Staging," Change 0

CFSG-006, "EFW Storage Tank Makeup," Change 0

1FSG-007, "Loss of DC Power," Change 0

2FSG-007, "Loss of DC Power," Change 0

1FSG-010, "CFT Isolation or Venting," Change 0

CFSG-011, "Alternate Spent Fuel Pool Makeup," Change 0

Procedures

Procedure 1903.67, Position Guide E, "EOF Facility Procedure Task Guide for ADMIN/Logistics Coordinator," Rev. 35

Procedure 1202.008, "Blackout," Change 15 (ANO-1)

Procedure 2202.008, "Station Blackout," Rev. 13 (ANO-2)

OP-1015.005, "Operations Key Control", Rev. 29

OP-1304.223, "ANO-1 SFP Level Instrumentation Channel Functional Test," Rev. 1

OP-1304.223, "Unit 1 Spent Fuel Pool Level Instrumentation, Channel Functional Test, ANO-1," Rev. 1

OP-1015.003A, "Unit 1 Operations Logs," Change 90

OP-1903.062, "Communications System Operating Procedure," Rev. 26

FDS-001, "Unit 1 Extended Loss of AC Power," Change 1

EN-EP-601, "Corporate Emergency Operations," Rev. 9

Calculations/Analyses

CN-SEE-II-13-4, "Arkansas Nuclear One Unit 1 Reactor Coolant System Inventory, Boron Concentration, and Mode 5/6 Boric Acid Precipitation Analysis to Support the Diverse and Flexible Coping Strategies (FLEX)," Rev.1

CN-SEE-II-13-2, "Arkansas Nuclear One Unit 2 Reactor Coolant System Inventory, Shutdown Margin, and Modes 5 & 6 Boric Acid Precipitation Analysis to Support the Diverse and Flexible Coping Strategies (FLEX)," Rev.1

Calculation 97-R-0010-15, "Results of Bechtel's Evaluation of the Dardanelle Lock and Dam for a Safe Shutdown Earthquake (Maximum Earthquake) with a Ground Acceleration of 0.2g," Rev. 0

Calculation 95-D-1015-02, "Atmospheric Dump Valve Maintenance Platform Qualification," Rev. 0

Calculation CN-SEE-II-12-43, "Determination of the Time to Boil in the Arkansas Nuclear One (ANO) 1 & 2 Spent Fuel Pools after an Earthquake," Rev. 2

Calculation 97-R-0010-15, "Results of Bechtel's Evaluation of the Dardanelle Lock and Dam for Safe Shutdown Earthquake (Maximum Earthquake) with a Ground Acceleration of 0.2g," Rev. 0

Calculation NAI 1791-003, "Seismic Induced Hydraulic Response in the Arkansas Nuclear One Spent Fuel Pool," Rev. 0

CALC-ANOC-CS-14-00002, "ANO Units 1 and 2 ADV Seismic Evaluation for FLEX Implementation," Rev. 0

CALC-ANOC-IC-14-00001, "Mohr EFP-IL SFPI System Test Reports and Qualification Reports," Rev. 2

CALC-2.6.7.3, Auxiliary Building Main Steam Structural Steel-MSSS," Rev. 8

CALC-91-E-0139-01, "Heatup Rate of Room 2024 (2P7A) with No Room Cooling," Rev. 1

CALC-94-E-0095-35, "Charging Pump Room Heat-Up with Loss of HVAC," Rev. 0

CALC-10-E-0010-03, "ANO-1 EFW Room GOTHIC Heat-Up Calculations," Rev. 0

CALC-13-E-0005-01, "Heat-Up Calculation for AB Electrical Equipment Rooms and MCR Following BDBEE," Rev. 0

CALC-13-E-0005-06, EC#48342, "ANO Flex Diesel Sizing Calculation," Rev. 1

CALC-13-E-0005-07, "Design of SFPI Probe Mounting Bracket," Rev. 0

CALC-13-E-0005-09, "ANO-1 FLEX Phase 2 Steam Generator Makeup Pump Sizing", Rev. 1

CALC-13-E-0005-10, "ANO FLEX Phase 2 Spent Fuel Pool Makeup and Spray Pump," Rev. 1

CALC-13-E-0005-12, "ANO FLEX Phase 2 Inventory Transfer Pump Sizing," Rev. 1

CALC-13-E-0005-13, "ANO FLEX Phase 3 Requirements for National SAFER Response Center Pumps," Rev. 1

CALC-13-E-0005-30, "FLEX BWST Gravity Drain to QCST for Short-Term Makeup," Rev. 0

CALC-14-E-0002-01, "ANO-2 FLEX MAAP4 Containment Analysis," Rev. 0

CALC-14-E-0002-02, "ANO-2 FLEX Steam Generator Degraded heat Transfer Analysis," Rev. 0

CALC-14-E-0002-03, "Auxiliary Building Heatup for Rooms 2118, 2097, 2099, 2100, 2101, 2104, & 2091 under ELAP Conditions," Rev. 0

CALC-14-E-0002-04, "ANO-2 FLEX Phase 2 Steam Generator Makeup Pump Sizing," Rev. 0

CALC-14-E-0002-07, "ANO-2 FLEX Battery Load Shed Calculation," Rev. 0

CALC-14-E-0002-08, "ANO-2 FLEX Phase 3 Requirements for National SAFER Response Center Pumps," Rev. 0

CALC-14-E-0002-10, "ANO FLEX - Extreme Cold Weather Evaluation," Rev. 0

CALC-14-E-0002-11, "ANO-2 Design of SFPI Probe Mounting Bracket," Rev. 0

CALC-14-E-0002-15, "ANO-2 Seismic Qualification of Control Room Panels 2C501-1 & 2C501-2," Rev. 0

Drawings

E-2941, Sheet 16 (EC-44044), "Phase II, 480V Schematic Diagram," Rev. 0

Other Documents

AREVA Document No. 38-9233737-00, "SAFER Response Plan for Arkansas Nuclear One," Rev. 2, dated February 20, 2015

AREVA Document No. 51-9211112-000, "Support for Entergy Response to NRC Audit Question on Decay Heat for Hypothetical ELAP Event at ANO-1"

ENTG ANO83-RPT-001, "ANO FLEX Storage Location Separation Distance," Rev. 0

LTR-SCC-14-008, "Recommended Response to Entergy PWR Nuclear Plants OIP Audit Questions," Rev. 0

SEP-FLEX-001, "Diverse and Flexible Coping Strategies (FLEX) Program Plan," Rev. 0 (Draft).

Enercon Project No. ENTGANO088, "Report of Geotechnical Exploration FLEX Equipment Storage Buildings Arkansas Nuclear One (ANO) Generating Station," dated August 26, 2013, revised December 10, 2013.

Letter dated November 26, 1985 from Combustion Engineering to Mr. C.D. Blanchard, "Our discussions on 11/20/85, subject of Gaulin's test data on non-lubricated packing sets"

Engineering Change (EC) 44044, "ANO-1 Electrical Flex Mods," Rev. 0

EC 46391, "ANO-2 Electrical Flex Mods," Rev. 0

EC 44045, Attachment 6.002, "FLEX Debris Removal Assessment for Arkansas Nuclear One," Rev. 0, dated August 6, 2014

EC 44046, "ANO-1 Spent Fuel Pool Level Instrumentation Upgrade," Rev. 0

EC 48348, "ANO-2 Spent Fuel Pool Level Instrumentation Upgrade," Rev. 0

ANO-2 Safety Analysis Report, Amendment 25

Corrective Action Program Documents

LR-LAR-2012-00087, CA 97

LR-LAR-2012-00087, CA 98

LR-LAR-2012-00087, CA 99

LR-LAR-2012-00087, CA 102

LR-LAR-2012-00087, CA 101

LR-LAR-2012-00087, CA100

LR-LAR-2012-00087, CA 94

LR-LAR-2012-00087, CA 95

LR-LAR-2012-00088, CA 70

LR-LAR-2012-00088, CA 73

ANO
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 Summary Description	Licensee Input Needed
OI 3.2.1.D	RCS makeup strategy	Licensee is evaluating ways to provide more than one path to both Unit 1 and Unit 2 RCS. For Unit 2 the licensee is evaluating a valve lineup possibility for a second flow path and for Unit 1 an alternate hose connection point. Provide a paper describing backup flowpaths and incorporate into overall plan.
CI 3.2.1.A	ADV and associated piping	Provide reasonable protection justification for the ability of the ADVs and associated piping to survive a tornado event, including potential tornado missiles.
CI 3.2.1.C	Turbine Driven Emergency Feedwater (EFW) pump steam supply piping	Provide reasonable protection justification for the ability of the turbine driven EFW (TDEFW) steam supply piping to survive a tornado event, including potential tornado missiles.
CI 3.2.4.7.A	Mobile Boration Unit strategy	Finish strategy development and make available for NRC review.
AQ.67	Steam Generator (SG) makeup water supply	NRC review of Finite Element Analysis (FEA) is ongoing. Licensee will need to continue to support this review. Relates to SE-33.
AQ.84	ADV operation during ELAP	Provide justification that the operators can access the ADVs and operate them after a tornado event.
AQ.86	ADV environmental conditions during ELAP	Provide an analysis of the temperature and required stay times in the ADV rooms. Also provide an assessment of the ability of the ADVs to operate for their complete mission time under ELAP conditions.
AQ.106	RCS makeup tank ability to survive tornado missile	Provide a completed draindown analysis for the Refueling Water Tank (RWT) and Borated Water Storage Tank (BWST) that incorporates the potential tornado missile strike. NRC review of the tank finite element analysis will be covered by item SE-33
AQ.113	Deployment of equipment during flood	Provide more detailed formal description of capabilities for capabilities to transport heavy FLEX equipment (diesels, pumps) from backup storage or NSRC to deployable positions during flood persistence time.

Audit Item Reference	Item Summary Description	Licensee Input Needed
AQ.129	TDEFW minimum flow recirculation line seismic qualification	Provide an evaluation of the impact of the non-seismic minimum flow lines on the overall strategy.
SE.21	RCS makeup and boration	Provide information for both Units 1 and 2 describing the need to vent. The evaluation should include the following: Does the analysis show the need to vent the RCS to inject the required amount of boron? Discuss the steps in procedures that allow for venting (opening and closing criteria). Confirm that a water solid RCS will not be permitted. Also, discuss whether ANO has plans to use the pressurizer Power Operated Relief Valves to vent.
SE.27	Core Flood Tank (CFT) injection	For Unit 1, provide the calculation for ensuring that nitrogen does not inject from the CFT into the RCS during the event.
SE-29	Containment electrical equipment environmental qualification for ELAP conditions.	Provide summary evaluation for Units 1 and 2 regarding the qualification under ELAP conditions of containment electrical equipment to support indefinite coping.
SE-30	Protection for panel on Post Accident Sampling System (PASS) Building roof	Provide an assessment of the ability of the connection panel on the PASS building roof to survive the initiating external event.
SE-31	Cable routing, under flooding conditions, from FLEX diesel-driven electrical generator (DG) on platform to patch panel on PASS building roof	Provide an evaluation that addresses NRC concerns regarding potential submergence of the cable (for both the cable and splices/connectors), and/or stresses on the connection points due to hanging the cable (during normal conditions and stormy/windy weather – cadence may amplify forces on connection points).
SE-33	Finite Element Analysis report for tornado qualification of RWT, BWST, and Qualified Condensate Storage Tank (QCST).	Provide the FEA analysis for review and answer any associated NRC staff methodology questions.
SE-34	Tornado separation distance.	Provide an evaluation of the separation distance of the buildings using an area sufficiently similar to the area enclosed by a 1-degree latitude-longitude box using the 95-percentile tornado.

ANO

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
CI 3.2.1.2.B	RCP seals	NRC review and endorsement of Flowserve white paper.
CI 3.2.1.3.A	Decay heat model	NRC staff needs to perform further review of the decay heat models used in the analysis.
SE.23	Raw water sources	NRC review of audit information posted on the ePortal regarding the potential for raw water use (Units 1 and 2) and its impact on the ability to cool the core needs to be completed.
SE.26	ANO-1 thermal/hydraulic analysis	NRC staff must complete review of the analysis for Unit 1 available on the ePortal

review to date led to the issuance of the ANO ISE and RAI dated October 29, 2013 (ADAMS Accession No. ML13281A502). 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 e-portals, 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 ANO from April 20 – 23, 2015, per the audit plan dated March 9, 2015 (ADAMS Accession No. ML15054A320). 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 301-415-2833 or by e-mail at Peter.Bamford@nrc.gov.

Sincerely,
/RA/
Peter Bamford, Senior Project Manager
Orders Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Docket Nos. 50-313 and 50-368
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